

TECHNICAL MEMORANDUM

DATE: March 14, 2017

TO: Rob Crittenden, P.E.
City of Redmond

FROM: Jeff Haynie, P.E.
TENW

SUBJECT: Revised Traffic Analysis and Travel Time Study
Bear Creek Design District 1 (BCDD1) Zoning Code Amendment
TENW Project No. 4977

TENW has completed a revised traffic analysis of the proposed Bear Creek Design District 1 (BCDD1) Zoning Code amendment. The proposed zoning code amendment would amend the current zoning to allow non-age restricted multifamily housing. The current code allows up to 347 age-restricted senior housing units ("Maximum Allowable") and requires any senior housing development to substantially conform to a site plan developed by Aegis ("Aegis Plan"). While the senior housing site plan itself does not specify the number of potential units associated with development in this zone, Aegis proposed to construct approximately 155 senior housing units in the zone. The applicant proposed to limit multifamily units in the zone to 248 units, and the potential traffic impacts were analyzed in 2016 ("Previously Proposed Zoning Code Amendment"). The applicant now proposes to limit all-ages multifamily units in the zone to 195 units as part of this proposed zoning code amendment. The analysis accordingly compares the traffic impacts associated with the following scenarios:

- A. Existing Zoning (maximum reasonable development for age-restricted housing) = 347 senior housing units
- B. Existing Zoning Aegis Plan = 155 senior housing units
- C. Previously Proposed Zoning Code Amendment = 248 multifamily apartments
- D. Zoning Code Amendment (Maximum Density) = 195 multifamily apartments

Findings & Conclusions

Trip Generation Comparison.

Scenario C – Previously Proposed Zoning Code Amendment (248 apartments). A 248-unit apartment development that would be allowed with the proposed zoning code amendment would generate 56 additional AM peak hour trips and 69 additional PM peak hour trips when compared to Scenario A (347 senior housing units). A 248-unit apartment development would generate 94 additional AM peak hour trips and 115 additional PM peak hour trips when compared to Scenario B (155 senior housing units).

Scenario D – Zoning Code Amendment – Maximum Density (195 apartments). A 195-unit apartment development that would be allowed with the proposed zoning code amendment would generate 30 additional AM peak hour trips and 40 additional PM peak hour trips when compared Scenario A (347 senior housing units). A 195-unit apartment development would generate 68 additional AM peak hour trips and 86 additional PM peak hour trips when compared to Scenario B (155 senior housing units).

Level of Service Comparison. The increase in vehicle delays at study intersections along Avondale Road NE with a 248-unit or a 195-unit apartment development allowed under the proposed zoning code amendment are not significantly different than the delays with a 347-unit or a 155-unit senior housing development allowed under existing zoning.

Travel Time Comparison. A travel time study was conducted along the Avondale Road NE corridor between Novelty Hill Road NE and Union Hill Road NE (1.09 miles)

Access to the site is assumed to be provided by the addition of a 4th leg to the signalized intersection of Avondale Road/180th Avenue NE. The addition of the 4th leg by itself is expected to cause a delay in travel time on Avondale Road. This is due to the need to provide more "green time" to the side street movement, thus increasing the "red time" for vehicles on Avondale Road. To isolate the impacts from project traffic alone, a corridor travel time analysis was conducted assuming access via an unsignalized access driveway on Avondale Road and access via the signal at 180th Avenue NE. The results are presented in the table below.

Avondale Road NE Corridor Future (2019) Synchro Travel Time Results¹

Scenario	AM Peak Period (7-9 a.m.)		PM Peak Period (4-6 p.m.)	
	Northbound	Southbound	Northbound	Southbound
Unsignalized access on Avondale Rd NE south of 180th Ave NE				
A) 2019 Without Code Amendment (347 senior housing units)	2:46	5:26	5:31	2:25
B) 2019 Without Code Amendment (155 senior housing units)	2:46	5:22	5:27	2:25
C) 2019 With Code Amendment (248 apartments)	2:46	5:35	5:39	2:25
D) 2019 With Code Amendment (195 apartments)	2:45	5:32	5:36	2:25
Delta (248 apts vs. 347 sr. housing)	0:00	+0:09	+0:08	0:00
Delta (248 apts vs. 155 sr. housing)	0:00	+0:13	+0:12	0:00
Delta (195 apts vs. 347 sr. housing)	-0.01	+0.06	+0.05	0:00
Delta (195 apts vs. 155 sr. housing)	-0.01	+0.10	+0.09	0:00
Signalized access at Avondale Rd NE/180th Ave NE				
A) 2019 Without Code Amendment (347 senior housing units)	2:49	5:26	5:28	2:29
B) 2019 Without Code Amendment (155 senior housing units)	2:49	5:18	5:23	2:28
C) 2019 With Code Amendment (248 apartments)	2:49	5:44	5:46	2:29
D) 2019 With Code Amendment (195 apartments)	2:48	5:36	5:41	2:23
Delta (248 apts vs. 347 sr. housing)	0:00	+0:18	+0:18	0:00
Delta (248 apts vs. 155 sr. housing)	0:00	+0:26	+0:23	+0:01
Delta (195 apts vs. 347 sr. housing)	-0.01	+0.08	+0.13	-0.06
Delta (195 apts vs. 155 sr. housing)	-0.01	+0.16	+0.18	-0.05

¹ Travel time study limits are between Union Hill Road NE and Novelty Hill Road NE.

With unsignalized access to the development, the total travel time on the Avondale Road NE corridor between Novelty Hill Road NE and Union Hill Road NE (1.09 miles) in the southbound (peak) travel direction during the AM peak hour would be expected to increase by only 9 to 13 seconds with the 248 apartments or increase by 6 to 10 seconds with the 195 apartments when compared to the senior housing scenarios. Similarly, the total travel time on the Avondale Road NE corridor between Union Hill Road NE and Novelty Hill Road with unsignalized access during the PM peak hour in the northbound (peak) travel direction would be expected to increase by 8 to 12 seconds with the 248 apartments or increase by 5 to 9 seconds with the 195 apartments when compared to the senior housing scenarios. Given the travel times experienced today and expected in the future, these increases in travel times are not anticipated to be significant.

With signalized access to the development, the total travel time on the 1.09-mile Avondale Road NE corridor between Novelty Hill Road NE and Union Hill Road NE in the southbound (peak) travel direction during the AM peak hour would be expected to increase by 18 to 26 seconds with the 248 apartments or increase by 8 to 16 seconds with the 195 apartments when compared to the senior housing scenarios. Similarly, the total travel time on the Avondale Road NE corridor between Union Hill Road NE and Novelty Hill Road with signalized access during the PM peak hour in the northbound (peak) travel direction would be expected to increase by 18 to 23 seconds with the 248 apartments or increase by 13 to 18 seconds with the 195 apartments when compared to the senior housing scenarios. As noted above, approximately half of this additional travel time is associated with adding a 4th leg to the signalized intersection at Avondale Road/180th Avenue NE.

The off-peak travel directions (northbound in the AM peak hour and southbound in the PM peak hour) would be expected to experience minimal additional delays (1 second or less) as a result of 248 apartment units when compared to the senior housing scenarios and would be expected to result in a decrease in delays of 1 to 6 seconds as a result of 195 apartments when compared to the senior housing scenarios with signalized access.

Next Steps. Approval of this zoning code amendment does not constitute approval of a specific development application. Rather, the City Council's approval of this zoning code amendment would allow the City planning department to process a development application for a non-age restricted apartment development in this zone. The development permitting process would require a more detailed Traffic Impact Analysis (TIA) for a development application that would require the analysis of the traffic impacts of a specific project. This detailed TIA would include, but may not be limited to, the following:

1. Scoping and coordination with City of Redmond
2. Additional evaluation of off-site intersections
3. Detailed evaluation of site access operations
4. Confirmation of frontage improvements
5. Confirmation of traffic mitigation (off-site and/or access-related improvements, and impact fees)

Introduction

The area related to the zoning code amendment is located on the east side of Avondale Road NE in the vicinity of 180th Avenue NE (see **Figure 1**). This study analyzes the effect of the Zoning Code Amendment's proposal to allow all-ages multi-family development in this zone and does not analyze a specific project. The current zoning would allow the development of up to 347 senior housing units under the reasonable worst case scenario that could occur under existing zoning. The current code also requires any senior housing development to substantially conform to the proposed Aegis Plan, which does not specify the number of potential units associated with development in this zone. However, Aegis proposed to construct approximately 155 senior housing units in the zone, which was ultimately not developed. It is anticipated that any future senior housing development would be allowed to construct more units than the 155 senior housing units proposed under the Aegis plan. The previously proposed zoning code amendment assumed 248 apartment units as the reasonable worst-case scenario that could occur under the proposed zoning code amendment with a density limitation. However, the City has since requested that the Applicant reconsider a maximum density with the zoning code amendment of 195 apartment units.

The analysis presented in this memorandum accordingly compares the traffic impacts associated with the following four (4) land use scenarios:

- A. Existing Zoning (maximum reasonable development for age-restricted housing) = 347 senior housing units
- B. Existing Zoning Aegis Plan = 155 senior housing units
- C. Previously Proposed Zoning Code Amendment = 248 multifamily apartments
- D. Zoning Code Amendment (Maximum Density) = 195 multifamily apartments

To compare the traffic impacts of the four (4) land use (zoning) scenarios identified above, the following items were addressed:

1. Comparison of trip generation
2. Comparison of intersection LOS and delay impacts at study intersections in the site vicinity
3. Comparison of travel time on the Avondale Road NE corridor in the site vicinity

Existing Conditions

Existing Traffic Volumes

Based on discussions with the City of Redmond, existing AM and PM peak hour traffic counts were collected at the following five signalized study intersections:

1. Avondale Rd NE / NE Novelty Hill Rd
2. Avondale Rd NE / NE 95th Street
3. Avondale Rd NE / 180th Ave NE
4. Avondale Rd NE / Avondale Way NE
5. Avondale Rd NE / NE Union Hill Rd

AM and PM peak hour traffic counts used in the analysis were conducted in January 2016. **Figure 2** illustrates the existing 2016 AM and PM peak hour traffic volumes at the study intersections.



Figure 1: Project Site Vicinity

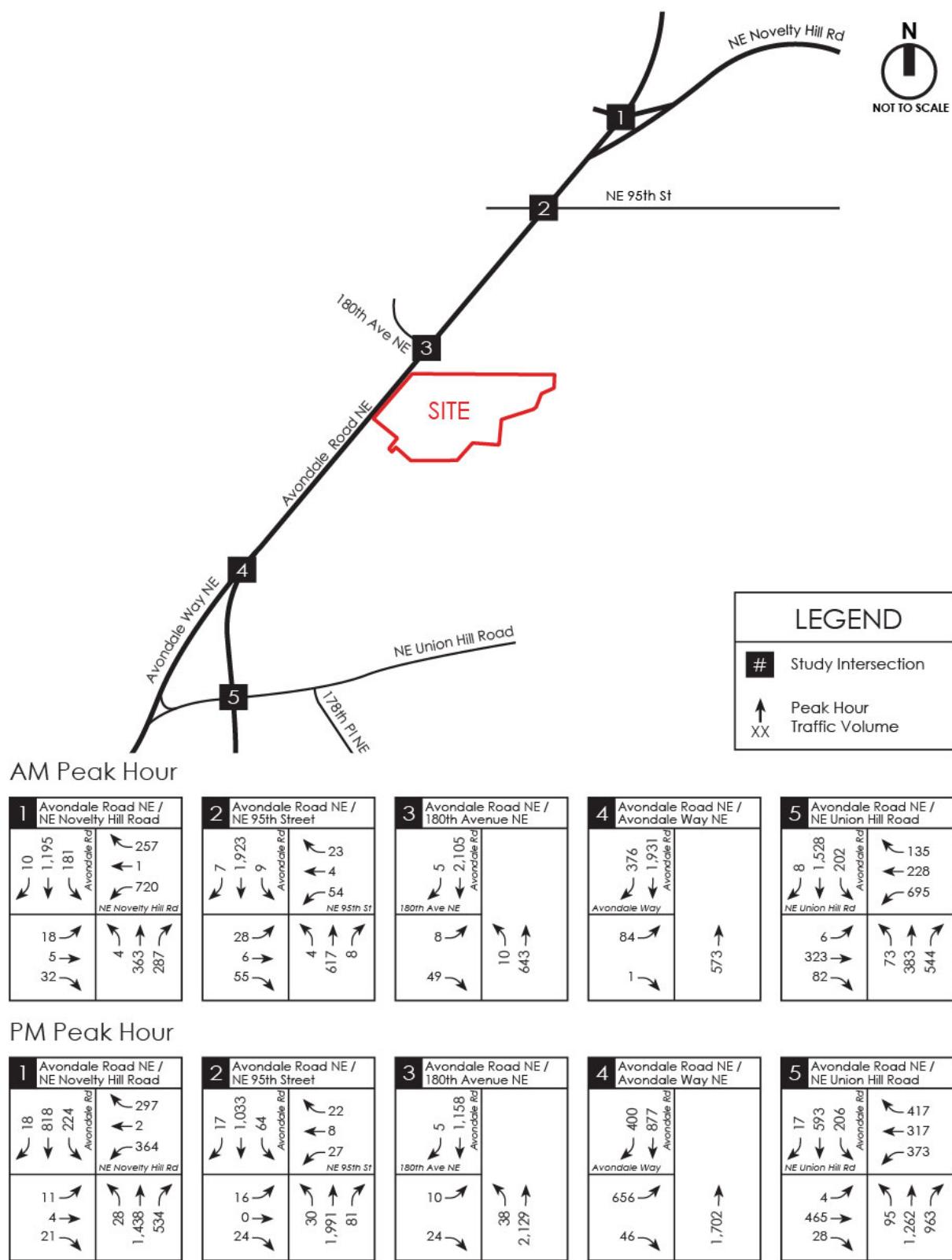


Figure 2: 2016 Existing Peak Hour Traffic Volumes

Future Conditions

Trip Generation

The trip generation estimates for the four land use scenarios (347 senior housing units vs. 155 senior housing units vs. 248 apartments vs. 195 apartments) were based on methodology documented in the Institute of Transportation Engineers (ITE) *Trip Generation* Manual, 9th Edition. Specifically, ITE land use code (LUC) 252 (Senior Adult Housing-Attached) and LUC 220 (Apartments) were used in the trip generation estimates. **Table 1** provides a summary of the trip generation estimates including the net difference in trips with the apartment land use scenarios when compared to the senior housing land use scenarios.

Table 1
Trip Generation Summary

Time Period / Scenario	<u>Trips Generated</u>		
	In	Out	Total
<u>Weekday AM Peak Hour</u>			
A) Current Zoning (347 Senior Housing Units)	23	46	69
B) Aegis Plan (155 Senior Housing Units)	11	20	31
C) Previously Proposed Zoning Code Amendment (248 Apartments)	25	100	125
D) Zoning Code Amendment – Max Density (195 Apartments)	20	79	99
Difference in Trips (248 apts vs. 347 sr. housing) =	+2	+54	+56
Difference in Trips (248 apts vs. 155 sr. housing) =	+14	+80	+94
Difference in Trips (195 apts vs. 347 sr. housing) =	-3	+33	+30
Difference in Trips (195 apts vs. 155 sr. housing) =	+9	+59	+68
<u>Weekday PM Peak Hour</u>			
A) Current Zoning (347 Senior Housing Units)	46	39	85
B) Aegis Plan (155 Senior Housing Units)	21	18	39
C) Previously Proposed Zoning Code Amendment (248 Apartments)	100	54	154
D) Zoning Code Amendment – Max Density (195 Apartments)	81	44	125
Difference in Trips (248 apts vs. 347 sr. housing) =	+54	+15	+69
Difference in Trips (248 apts vs. 155 sr. housing) =	+79	+36	+115
Difference in Trips (195 apts vs. 347 sr. housing) =	+35	+5	+40
Difference in Trips (195 apts vs. 155 sr. housing) =	+60	+26	+86

As shown in **Table 1**, the 248-unit apartment scenario would generate 56 additional AM peak hour trips and 69 additional PM peak hour trips when compared to Scenario A (347 senior housing units) and the 248-unit apartment scenario would generate 94 additional AM peak hour trips and 115 additional PM peak hour trips when compared to Scenario B (155 senior housing units).

As also shown in **Table 1**, the 195-unit apartment scenario would generate 30 additional AM peak hour trips and 40 additional PM peak hour trips when compared to Scenario A (347 senior housing units) and the 195-unit apartment scenario would generate 68 additional AM peak hour trips and 86 additional PM

peak hour trips when compared to Scenario B (155 senior housing units). The detailed trip generation calculations are included in **Attachment A**.

Trip Distribution and Assignment

The distribution of project trips was based on existing travel patterns in the project vicinity. **Table 2** summarizes the resulting general project trip distribution.

Table 2
Peak Hour Project Trip Distribution

Route (Direction)	Trip Distribution
Avondale Rd NE (to/from the north)	20%
Avondale Way NE (to/from west)	20%
Avondale Rd NE (to/from the south)	50%
NE Union Hill Rd (to/from the east)	10%
TOTAL	100%

The AM and PM peak hour project trip distribution and assignment for the maximum allowable land use under existing zoning (347 senior housing units) is shown in **Figure 3** and the trip distribution and assignment for the Aegis Plan scenario (155 senior housing units) is shown in **Figure 4**. The AM and PM peak hour project trip distribution and assignment for the 248-unit apartment scenario is shown in **Figure 5** and the AM and PM peak hour project trip distribution and assignment for the 195-unit apartment scenario is shown in **Figure 6**.

Future Traffic Volumes

Based on general construction timelines, a reasonable completion date for any project on the site is 2019. Future year 2019 baseline (without project) peak hour traffic volumes were conservatively estimated by applying a 1 percent annual growth rate to the existing volumes and including pipeline project trips from the following projects as identified by the City of Redmond:

1. City Center
2. Bear Creek VIP Apartments
3. Costco

The 1 percent annual growth rate should be considered conservative because historical peak hour traffic volumes along Avondale Road between Union Hill Road and 180th Ave NE have shown no growth or negative growth between 2011 and 2016. The future year 2019 baseline (without project) AM and PM peak hour traffic volumes at the five study intersections are shown in **Figure 7**.

Adding the trip assignments from the Senior Housing and the Apartment land use scenarios (shown in **Figures 3-6**) to the future 2019 baseline traffic volumes results in the 2019 With-Project peak hour traffic volumes at the study intersections for each zoning scenario (shown in **Figure 8-11**).

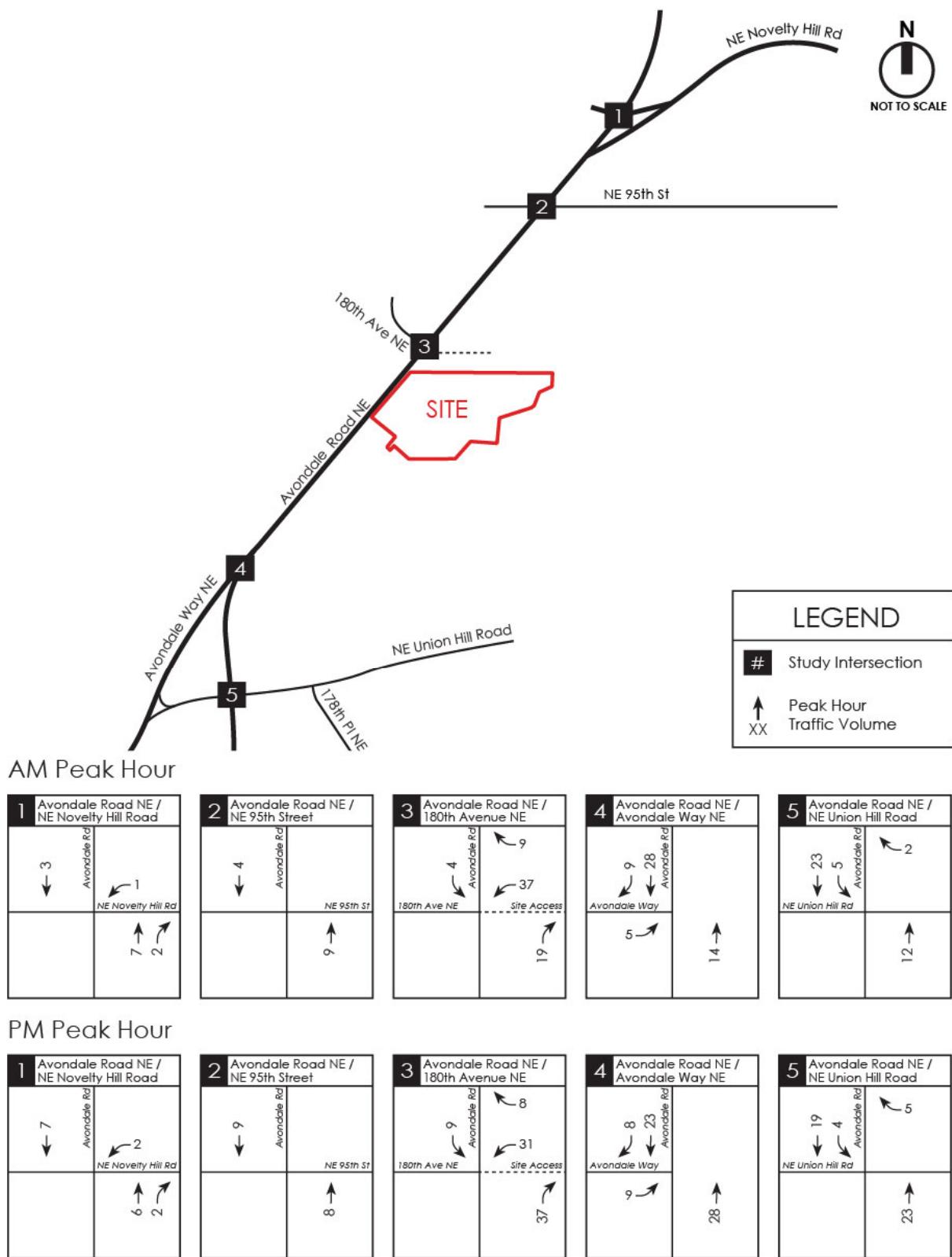


Figure 3: Peak Hour Project Trip Distribution and Assignment (347 senior housing units)

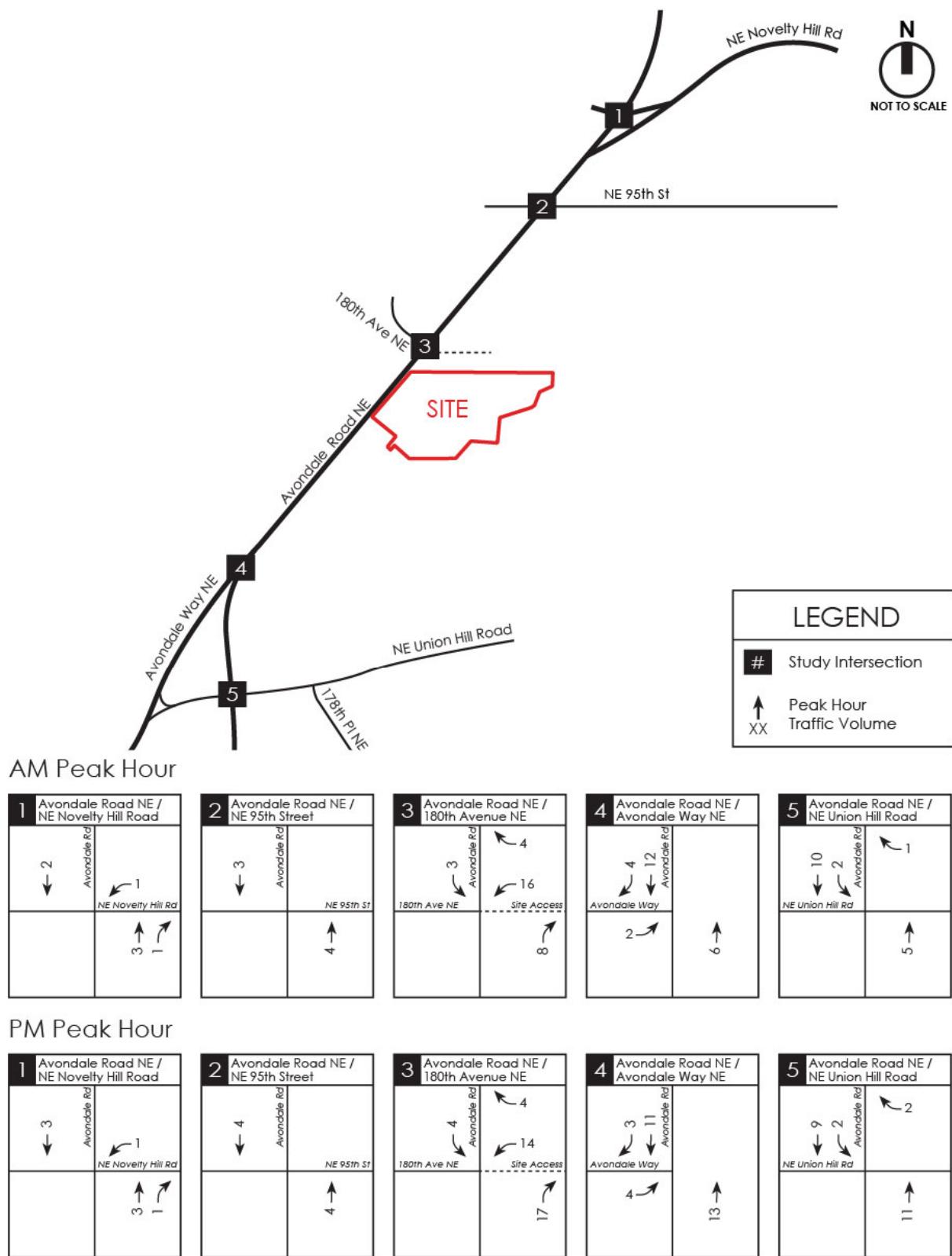


Figure 4: Peak Hour Project Trip Distribution and Assignment (155 senior housing units)

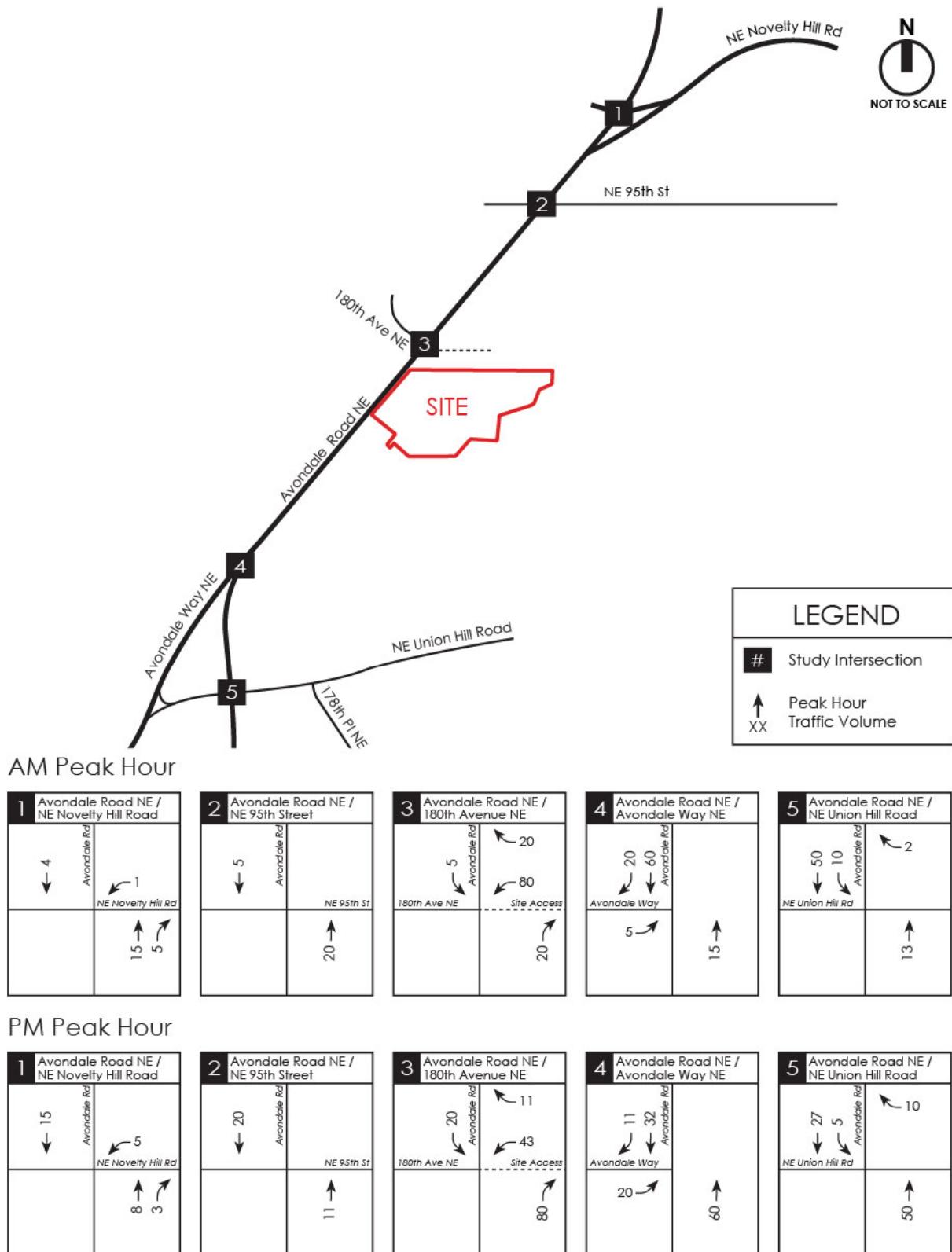


Figure 5: Peak Hour Project Trip Distribution and Assignment (248 apartment units)

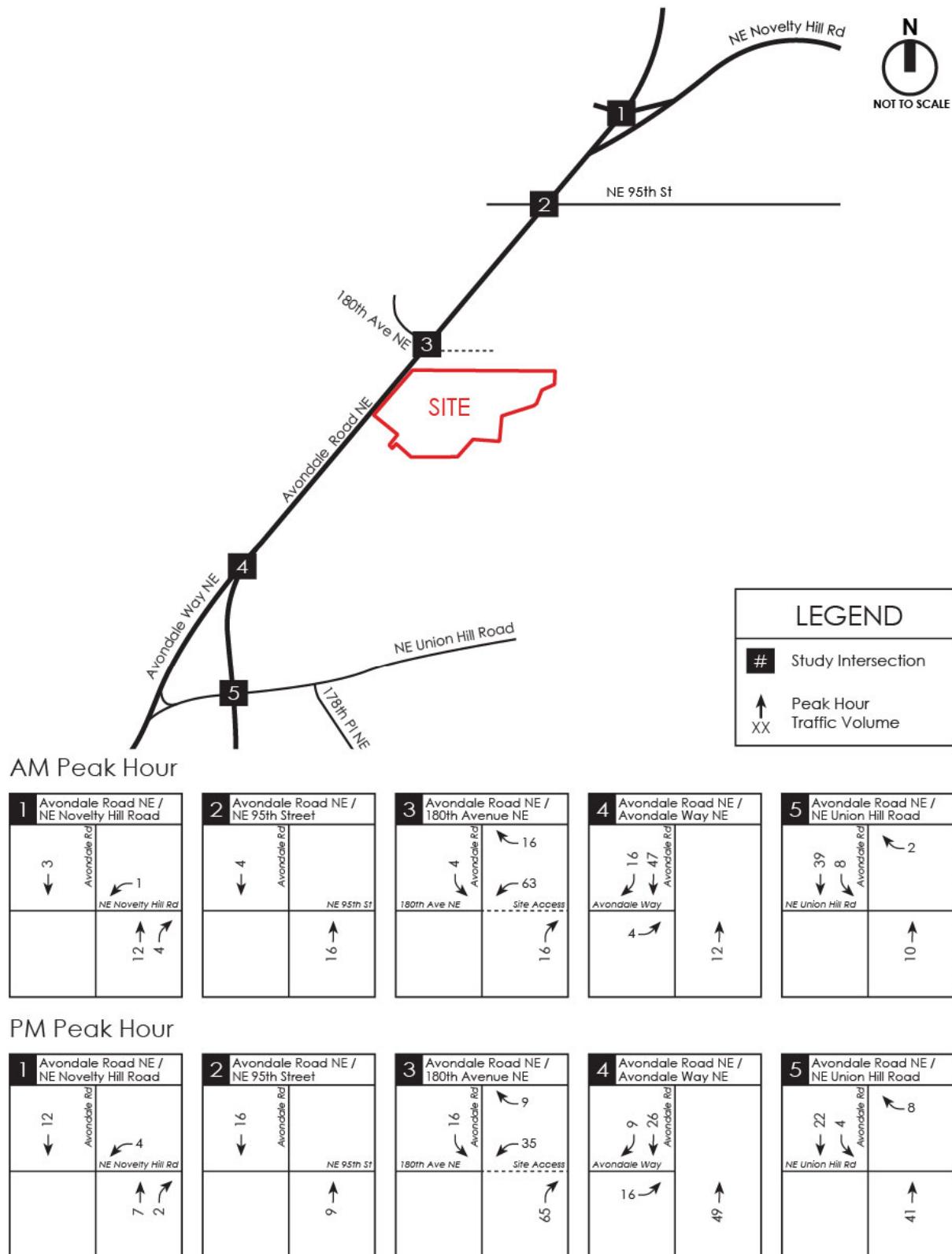


Figure 6: Peak Hour Project Trip Distribution and Assignment (195 apartment units)

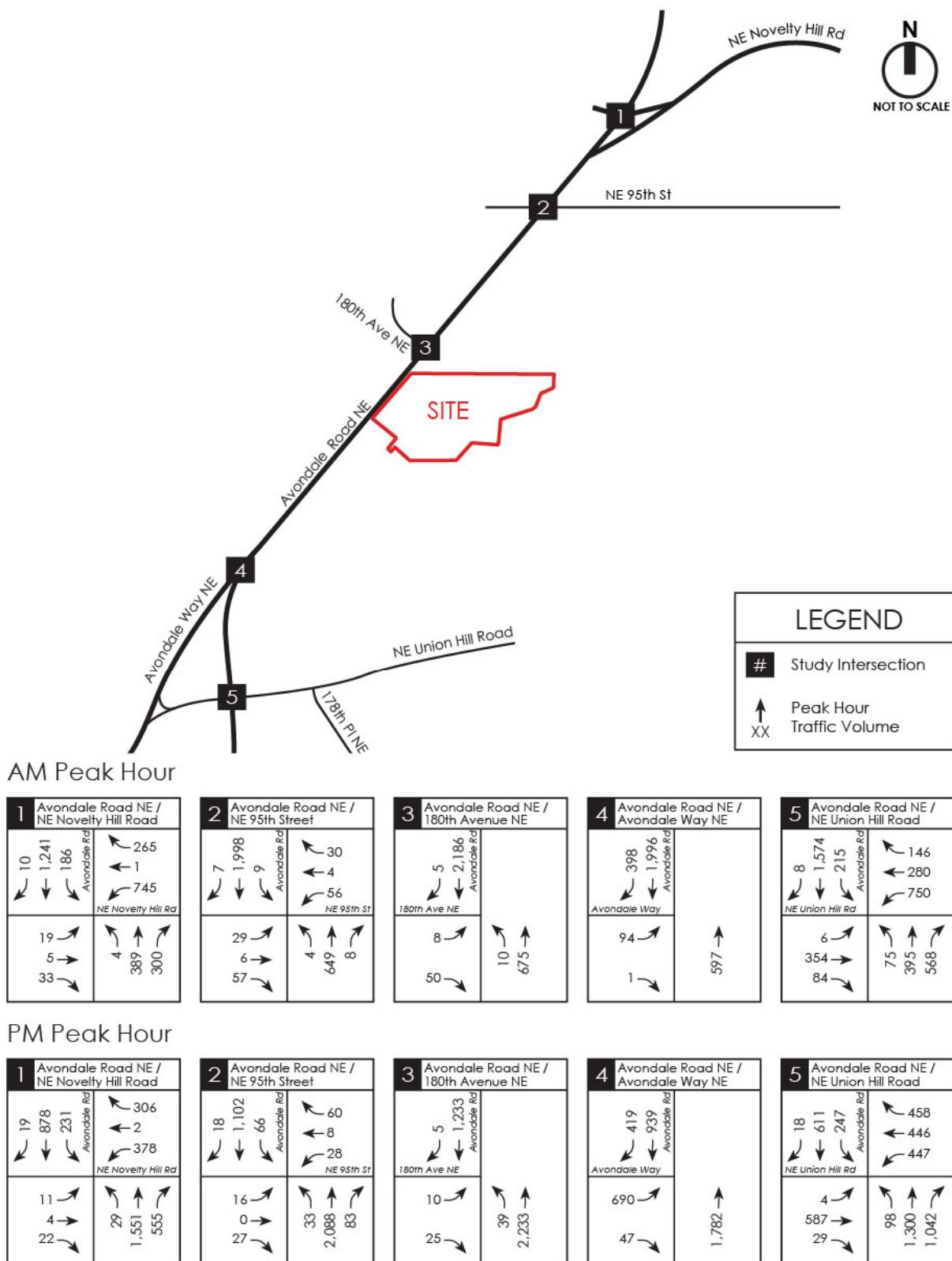


Figure 7: 2019 Without-Project Peak Hour Traffic Volumes

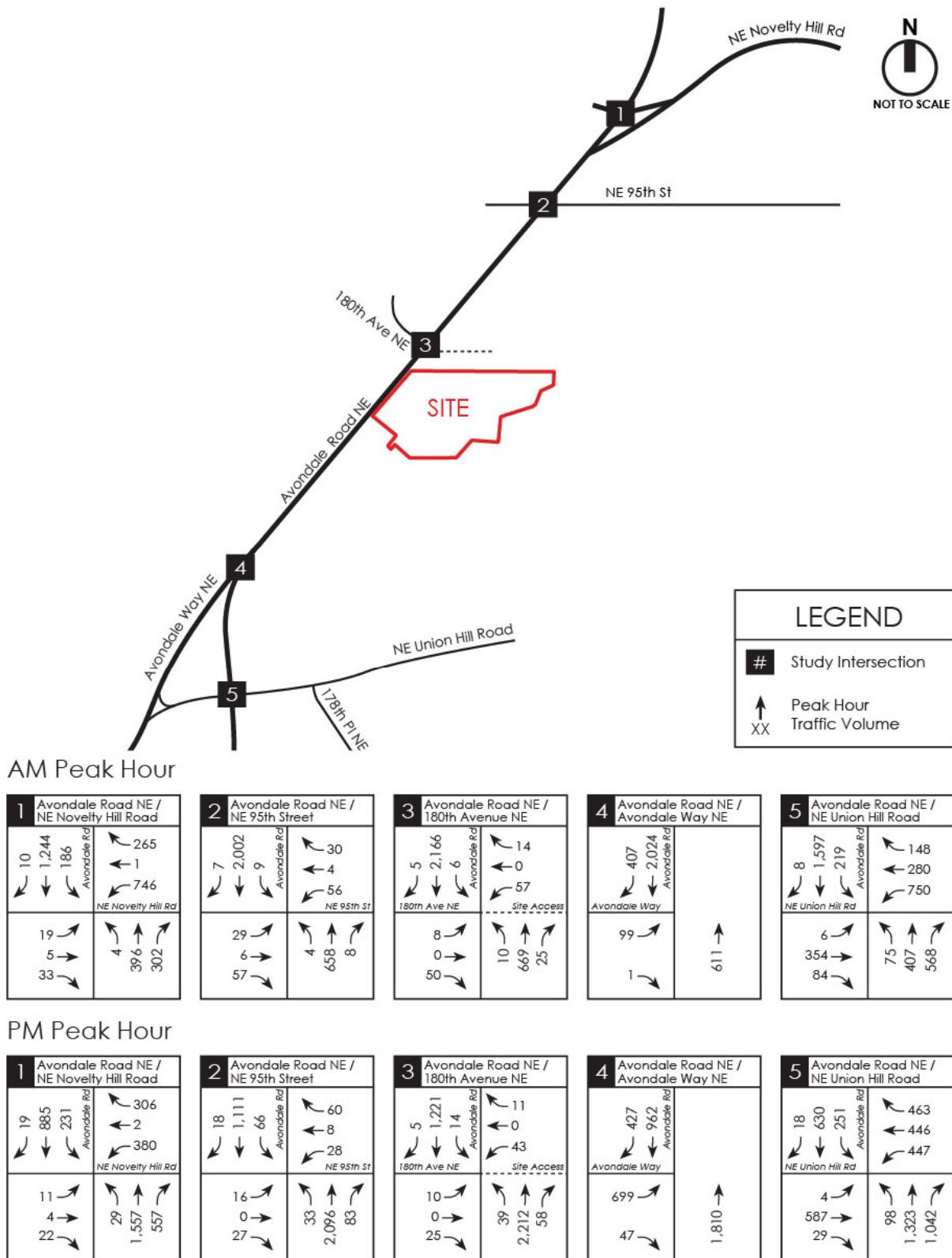


Figure 8: 2019 With-Project Peak Hour Traffic Volumes (347 senior housing units)

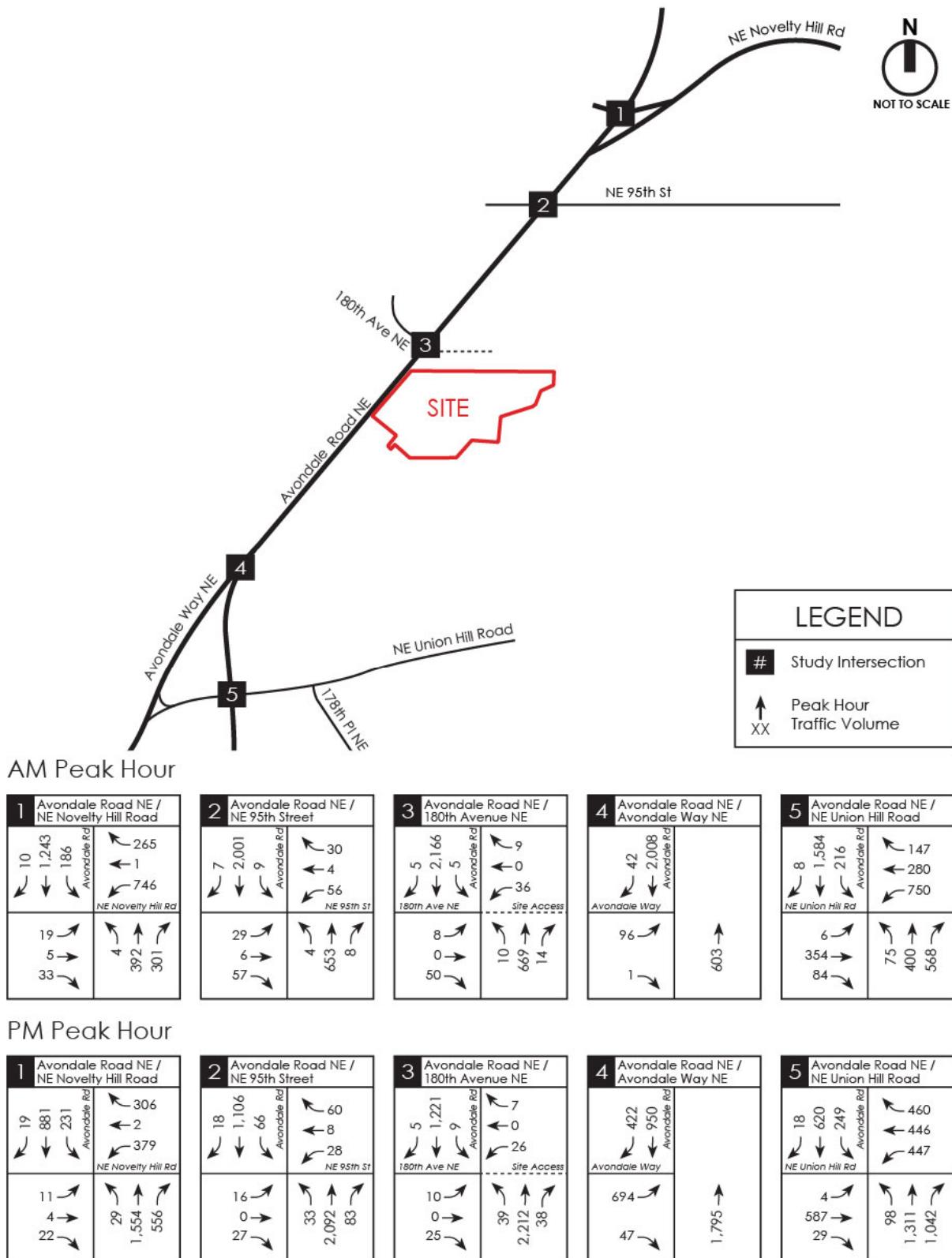


Figure 9: 2019 With-Project Peak Hour Traffic Volumes (155 senior housing units)

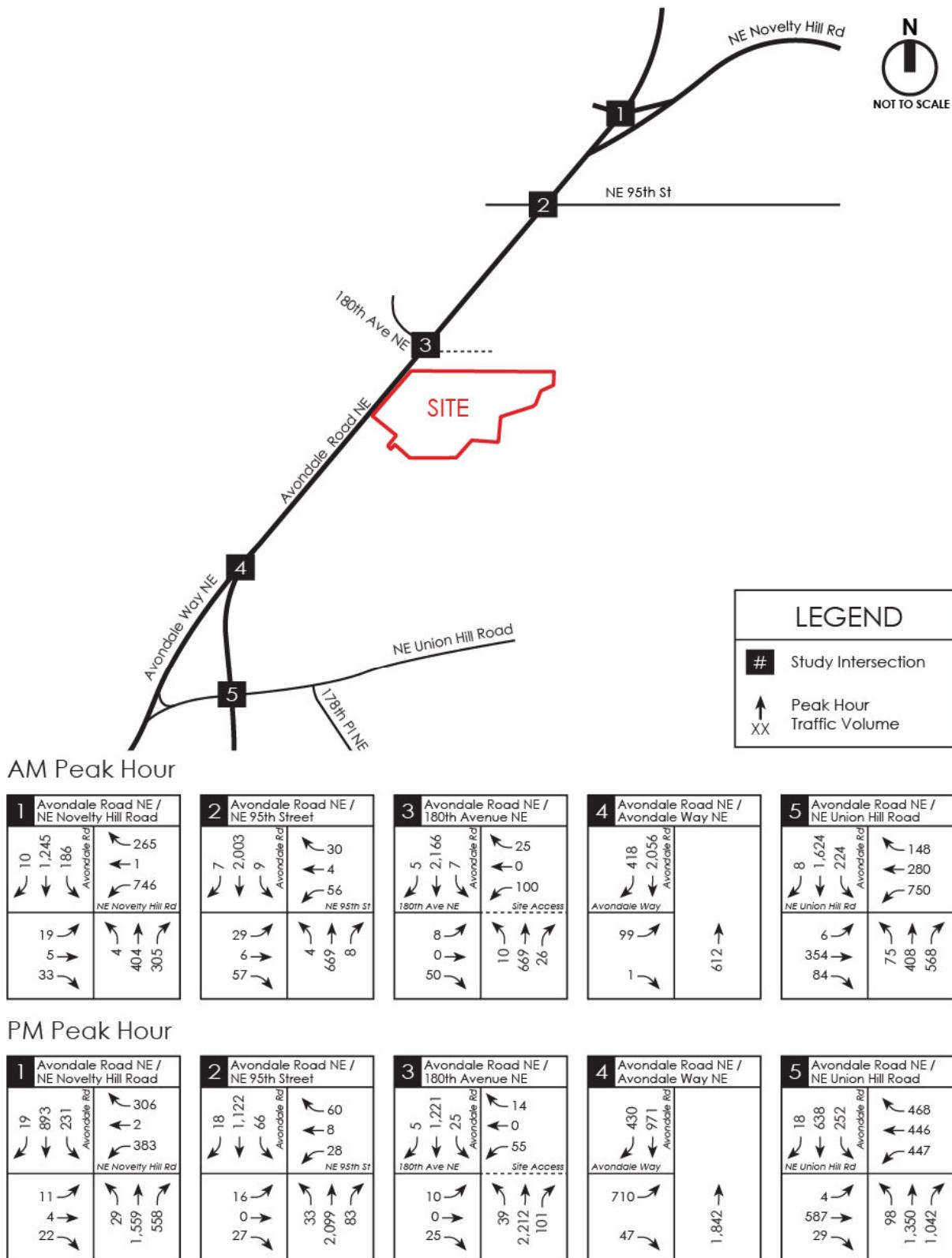


Figure 10: 2019 With-Project Peak Hour Traffic Volumes (248 apartment units)

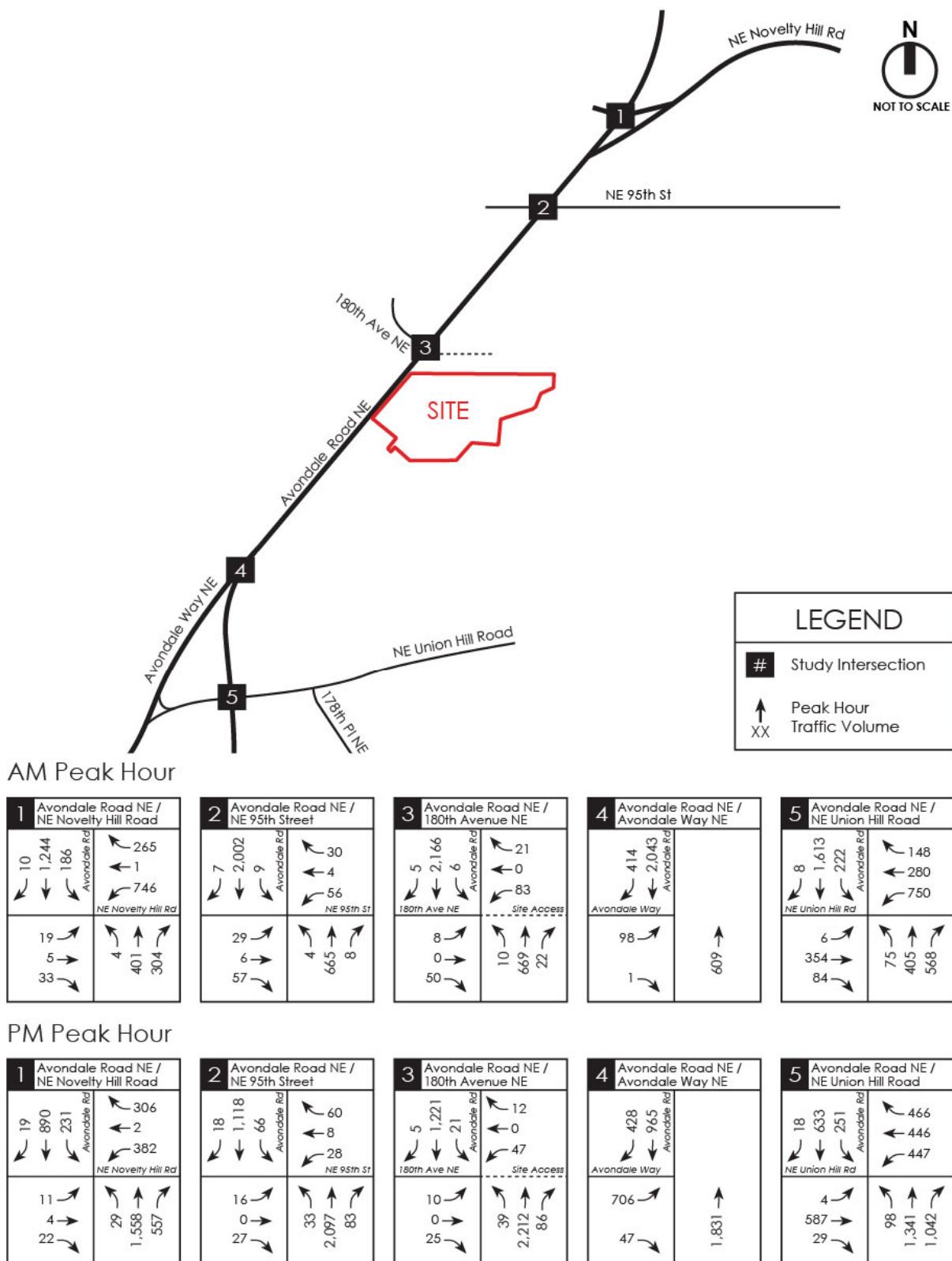


Figure 11: 2019 With-Project Peak Hour Traffic Volumes (195 apartment units)

Future Level of Service

Future year 2019 weekday peak hour With-Project Level of Service (LOS) analyses were conducted at the 5 study intersections for the following four (4) zoning scenarios:

- A. 2019 Without Code Amendment (Maximum Allowable Under Current Zoning) = 347 Senior Housing Units
- B. 2019 Without Code Amendment (Proposed Aegis Plan Under Current Zoning) = 155 Senior Housing Units
- C. 2019 With Previously Proposed Zoning Code Amendment = 248 Apartment Units
- D. 2019 With Code Amendment (Maximum Density) = 195 Apartment Units

LOS generally refers to the degree of congestion on a roadway or intersection. It is a measure of vehicle operating speed, travel time, travel delays, and driving comfort. A letter scale from A to F generally describes intersection LOS. At signalized intersections, LOS A represents free-flow conditions (motorists experience little or no delays), and LOS F represents forced-flow conditions where motorists experience an average delay in excess of 80 seconds per vehicle.

The LOS reported for signalized intersections represents the average control delay (sec/veh) and can be reported for the overall intersection, for each approach, and for each lane group (additional v/c ratio criteria apply to lane group LOS only).

The LOS reported at stop-controlled intersections is based on the average control delay and can be reported for each controlled minor approach, controlled minor lane group, and controlled major-street movement (and for the overall intersection at all-way stop controlled intersections). Additional v/c ratio criteria apply to lane group or movement LOS only). **Table 3** outlines the HCM 2010 LOS criteria for signalized and stop-controlled intersections based on these methodologies.

Table 3
LOS Criteria for Signalized and Stop-Controlled Intersections¹

Control Delay (sec/veh)	SIGNALIZED INTERSECTIONS		STOP-CONTROLLED INTERSECTIONS		
	≤ 1.0	> 1.0	Control Delay (sec/veh)	≤ 1.0	> 1.0
≤ 10	A	F	≤ 10	A	F
> 10 to ≤ 20	B	F	> 10 to ≤ 15	B	F
> 20 to ≤ 35	C	F	> 15 to ≤ 25	C	F
> 35 to ≤ 55	D	F	> 25 to ≤ 35	D	F
> 55 to ≤ 80	E	F	> 35 to ≤ 50	E	F
> 80	F	F	> 50	F	F

¹ Source: HCM2010 Highway Capacity Manual, Transportation Research Board, 2010.

² For approach-based and intersection-wide assessments at signals, LOS is defined solely by control delay.

³ For two-way stop controlled intersections, the LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole at two-way stop controlled intersections. For approach-based and intersection-wide assessments at all-way stop controlled intersections, LOS is solely defined by control delay.

Level of service calculations for intersections were based on methodology and procedures outlined in the 2010 update of the *Highway Capacity Manual*, Transportation Research Board (HCM 2010) using *Synchro 8.0* traffic analysis software. For the future year 2019 LOS analysis, access to/from the development would be provided at Avondale Road NE/180th Ave NE (study intersection #3) via a future east leg which would also provide access to the existing single family homes to the north. Under this scenario, intersection geometry and signal phasing/timing at the other 4 study intersections was based on existing conditions, with optimized network offsets.

The 2019 peak hour LOS results at the study intersections are summarized in **Table 4**. The LOS worksheets are included in **Attachment B**.

Table 4
Future Year (2019) Peak Hour Level of Service Summary¹

Signalized Study Intersection	Future Year 2019 ¹							
	(A) <u>Without Code Amendment</u> <u>(Max Allowable = 347 senior housing units)</u>		(B) <u>Without Code Amendment</u> <u>(Aegis Plan = 155 senior housing units)</u>		(C) <u>With Previously Proposed Code Amendment</u> <u>(248 apartments)</u>		(D) <u>With Code Amendment –</u> <u>Max Density (195 apartments)</u>	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
AM Peak Hour:								
#1 Avondale Rd NE / NE Novelty Hill Rd	F	111.0	F	111.2	F	110.8	F	110.9
#2 Avondale Rd NE / NE 95 th St	D	38.7	D	38.7	D	38.7	D	38.6
#3 Avondale Rd NE / 180 th Ave NE	A	9.4	A	6.9	C	20.4	B	15.3
#4 Avondale Rd NE / Avondale Way NE	A	2.9	A	3.0	A	2.8	A	2.8
#5 Avondale Rd NE / NE Union Hill Rd	E	59.0	E	58.5	E	60.3	E	59.7
PM Peak Hour:								
#1 Avondale Rd NE / NE Novelty Hill Rd	E	57.4	E	57.3	E	57.6	E	57.5
#2 Avondale Rd NE / NE 95 th St	B	17.7	B	18.0	B	14.9	B	16.4
#3 Avondale Rd NE / 180 th Ave NE	A	6.8	A	5.3	B	10.7	A	8.4
#4 Avondale Rd NE / Avondale Way NE	C	31.1	C	30.1	C	33.7	C	32.7
#5 Avondale Rd NE / NE Union Hill Rd	E	75.3	E	74.8	E	76.6	E	76.2

¹ Assumes signalized access to the development at Avondale Road NE/180th Ave NE.

As shown in **Table 4**, the intersection of Avondale Road NE/NE Novelty Hill Road (#1) is expected to operate at LOS F during the AM peak hour and LOS E during the PM peak hour under all zoning scenarios. Also, the intersection of Avondale Road NE/NE Union Hill Road (#5) is expected to operate at LOS E during both the AM and PM peak hours with all zoning scenarios. All other study intersections are anticipated to operate at LOS D or better during the AM and PM peak hours in 2019 under all zoning scenarios.

The increase in vehicle delays (seconds/vehicle) with a 248-unit or 195-unit apartment development under the proposed zoning code amendment are not significantly different than the vehicle delays with a 155-unit or a 347-unit senior housing development allowed under existing zoning at the study intersections. The most significant difference in intersection delay is an additional 5.9 to 13.5 seconds during the AM peak hour at Avondale Road NE/180th Ave NE which is to be expected as a result of additional side street trips (on 180th Ave NE) associated with the apartment scenarios. However, LOS C is an acceptable level of service in the City of Redmond and is not considered a significant impact.

At Avondale Road NE/NE Novelty Hill Road (#1), the intersection delay (seconds/vehicle) is anticipated to decrease slightly in the AM peak hour and increase slightly in the PM peak hour when comparing the apartments scenarios to the senior housing scenarios. Based on these results, 248 apartments with the zoning code amendment would not be considered a significant impact at this intersection.

At Avondale Road NE/NE Union Hill Road (#5), the difference in intersection delay (seconds/vehicle) between the senior housing scenarios and the apartments scenarios is less than 2 seconds in the AM and PM peak hours (approximately 3% different). Based on these results, the increase in delay at Avondale Road NE/NE Union Hill Road with the zoning code amendment would not be considered a significant impact.

Future Travel Time Analysis

A travel time study was conducted along the Avondale Road NE corridor between Novelty Hill Road NE and Union Hill Road NE (1.09 miles)

Access to the site is assumed to be provided by the addition of a 4th leg to the signalized intersection of Avondale Road/180th Avenue NE. The addition of the 4th leg by itself is expected to cause a delay in travel time on Avondale Road. This is due to the need to provide more “green time” to the side street movement, thus increasing the “red time” for vehicles on Avondale Road. To isolate the impacts of project traffic alone to Avondale Road NE, a corridor travel time analysis was conducted assuming access via an unsignalized access driveway on Avondale Road and access via the existing signal at 180th Avenue NE.

The *Synchro 8.0* traffic analysis software was used to report the anticipated travel time along the Avondale Road NE corridor during the AM and PM peak periods for each of the four zoning scenarios (347 senior housing units vs. 155 senior housing units vs. 248 apartments vs. 195 apartments).

The existing AM and PM peak hour Synchro files from the City of Redmond were calibrated to field-observed conditions based on a January 2016 peak period travel time study conducted on Avondale Road NE (see **Attachment C**). The calibration was completed so that the existing calibrated Synchro model reflected the observed (existing) travel times and travel speeds on Avondale Road NE during the AM and PM peak periods. The calibration included adjustments to link speeds, ideal saturated flow (vehicles per hour per lane) and lost time.

The anticipated travel times (min:sec) and travel speeds (mph) for the four zoning scenarios (347 senior housing units vs. 155 senior housing units vs. 248 apartments vs. 195 apartments) with both access scenarios (unsignalized vs. signalized) are summarized in **Table 5**. The travel time study worksheets from Synchro are included in **Attachment C**.

Table 5
Avondale Road NE Corridor Future (2019) Synchro Travel Time Results¹

Scenario	AM Peak Period (7-9 a.m.)		PM Peak Period (4-6 p.m.)	
	<u>Northbound</u> Travel Time (min:sec)	<u>Southbound</u> Travel Time (min:sec)	<u>Northbound</u> Travel Time (min:sec)	<u>Southbound</u> Travel Time (min:sec)
Unsignalized access on Avondale Rd NE south of 180th Ave NE				
A) 2019 Without Code Amendment (347 senior housing units)	2:46	5:26	5:31	2:25
B) 2019 Without Code Amendment (155 senior housing units)	2:46	5:22	5:27	2:25
C) 2019 With Code Amendment (248 apartments)	2:46	5:35	5:39	2:25
D) 2019 With Code Amendment (195 apartments)	2:45	5:32	5:36	2:25
Delta (248 apts vs. 347 sr. housing)	0:00	+0:09	+0:08	0:00
Delta (248 apts vs. 155 sr. housing)	0:00	+0:13	+0:12	0:00
Delta (195 apts vs. 347 sr. housing)	-0.01	+0.06	+0.05	0:00
Delta (195 apts vs. 155 sr. housing)	-0.01	+0.10	+0.09	0:00
Signalized access at Avondale Rd NE/180th Ave NE				
A) 2019 Without Code Amendment (347 senior housing units)	2:49	5:26	5:28	2:29
B) 2019 Without Code Amendment (155 senior housing units)	2:49	5:18	5:23	2:28
C) 2019 With Code Amendment (248 apartments)	2:49	5:44	5:46	2:29
D) 2019 With Code Amendment (195 apartments)	2:48	5:36	5:41	2:23
Delta (248 apts vs. 347 sr. housing)	0:00	+0:18	+0:18	0:00
Delta (248 apts vs. 155 sr. housing)	0:00	+0:26	+0:23	+0:01
Delta (195 apts vs. 347 sr. housing)	-0.01	+0.08	+0.13	-0.06
Delta (195 apts vs. 155 sr. housing)	-0.01	+0.16	+0.18	-0.05

¹ Travel time study limits are between Union Hill Road NE and Novelty Hill Road NE.

As shown in **Table 5**, with unsignalized access to the development south of 180th Ave NE, the total travel time on the 1.09-mile Avondale Road NE corridor between Novelty Hill Road NE and Union Hill Road NE in the southbound (peak) travel direction during the AM peak hour would be expected to be increase by 9 to 13 seconds with the 248 apartments or increase by 6 to 10 seconds with the 195 apartments when compared to the senior housing scenarios. Similarly, the total travel time on the Avondale Road NE corridor between Union Hill Road NE and Novelty Hill Road with unsignalized access during the PM peak hour in the northbound (peak) travel direction would be expected to increase by 8 to 12 seconds with the 248 apartments or increase by 5 to 9 seconds with the 195 apartments when compared to the senior housing scenarios. The off-peak travel directions (northbound in the AM peak hour and southbound in the PM peak hour) would be expected to experience no additional delays as a result of the apartment scenarios when compared to the senior housing scenarios with unsignalized access.

As also shown in **Table 5**, with signalized access to the development at 180th Ave NE, the total travel time on the 1.09-mile Avondale Road NE corridor between Novelty Hill Road NE and Union Hill Road NE in the

southbound (peak) travel direction during the AM peak hour would be expected to increase by 18 to 26 seconds with the 248 apartments or increase by 8 to 16 seconds with the 195 apartments when compared to the senior housing scenarios. Similarly, the total travel time on the Avondale Road NE corridor between Union Hill Road NE and Novelty Hill Road with signalized access during the PM peak hour in the northbound (peak) travel direction would be expected to increase by 18 to 23 seconds with the 248 apartments or increase by 13 to 18 seconds with the 195 apartments when compared to the senior housing scenarios. The off-peak travel directions (northbound in the AM peak hour and southbound in the PM peak hour) would be expected to experience minimal additional delays (1 second or less) as a result of 248 apartments and a decrease in delays of 1 to 6 seconds as a result of 195 apartments when compared to the senior housing scenarios with signalized access.

Next Steps

Approval of this zoning code amendment does not constitute approval of a specific development application. Rather, the City Council's approval of this zoning code amendment would allow the City's planning department to process a development application for a non-age restricted apartment development in this zone. The development permitting process would require a much more detailed Traffic Impact Analysis (TIA) for a development application that would require the analysis of the traffic impacts of a specific project. This detailed TIA would include, but may not be limited to, the following:

1. Scoping and coordination with City of Redmond
2. Additional evaluation of off-site intersections
3. Detailed evaluation of site access operations
4. Confirmation of frontage improvements
5. Confirmation of traffic mitigation (off-site and/or access-related improvements, and impact fees)

Attachments

ATTACHMENT A

Detailed Trip Generation

Bear Creek Design District 1

Trip Generation - 248 Apartments vs. 155 Senior Housing Units

Land Use	Units ¹	ITE LUC ²	Directional Split		Trip Rate	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY DAILY								
Aegis Plan: Senior Adult Housing-Attached	155	DU	252	50%	50%	3.44	267	266
Proposed Zoning: Multifamily (Apartments)	248	DU	220	50%	50%	Equation	813	813
WEEKDAY DAILY DIFFERENCE IN TRIPS							546	547
AM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	155	DU	252	34%	66%	Equation	11	20
Proposed Zoning: Multifamily (Apartments)	248	DU	220	20%	80%	Equation	25	100
AM PEAK HOUR DIFFERENCE IN TRIPS							14	80
PM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	155	DU	252	54%	46%	Equation	21	18
Proposed Zoning: Multifamily (Apartments)	248	DU	220	65%	35%	Equation	100	54
PM PEAK HOUR DIFFERENCE IN TRIPS							79	36
Notes: 1. DU = Dwelling Units. 2. Institute of Transportation Engineers (ITE) Trip Generation manual 9th edition land use code.								

Bear Creek Design District 1

Trip Generation - 248 Apartments vs. 347 Senior Housing Units

Land Use	Units ¹	ITE LUC ²	Directional Split		Trip Rate	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY DAILY								
Aegis Plan: Senior Adult Housing-Attached	347	DU	252	50%	50%	3.44	597	597
Proposed Zoning: Multifamily (Apartments)	248	DU	220	50%	50%	Equation	813	813
WEEKDAY DAILY DIFFERENCE IN TRIPS							216	216
AM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	347	DU	252	34%	66%	Equation	23	46
Proposed Zoning: Multifamily (Apartments)	248	DU	220	20%	80%	Equation	25	100
AM PEAK HOUR DIFFERENCE IN TRIPS							2	54
PM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	347	DU	252	54%	46%	Equation	46	39
Proposed Zoning: Multifamily (Apartments)	248	DU	220	65%	35%	Equation	100	54
PM PEAK HOUR DIFFERENCE IN TRIPS							54	15
Notes: 1. DU = Dwelling Units. 2. Institute of Transportation Engineers (ITE) Trip Generation manual 9th edition land use code.								

Bear Creek Design District 1

Trip Generation - 195 Apartments vs. 155 Senior Housing Units

Land Use	Units ¹	ITE LUC ²	Directional Split		Trip Rate	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY DAILY								
Aegis Plan: Senior Adult Housing-Attached	155	DU	252	50%	50%	3.44	267	266
Proposed Zoning:								
Multifamily (Apartments)	195	DU	220	50%	50%	Equation	653	652
WEEKDAY DAILY DIFFERENCE IN TRIPS							386	386
AM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	155	DU	252	34%	66%	Equation	11	20
Proposed Zoning: Multifamily (Apartments)	195	DU	220	20%	80%	Equation	20	79
AM PEAK HOUR DIFFERENCE IN TRIPS							9	59
PM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	155	DU	252	54%	46%	Equation	21	18
Proposed Zoning: Multifamily (Apartments)	195	DU	220	65%	35%	Equation	81	44
PM PEAK HOUR DIFFERENCE IN TRIPS							60	26
Notes:								
1. DU = Dwelling Units.								
2. Institute of Transportation Engineers (ITE) Trip Generation manual 9th edition land use code.								

Bear Creek Design District 1

Trip Generation - 195 Apartments vs. 347 Senior Housing Units

Land Use	Units ¹	ITE LUC ²	Directional Split		Trip Rate	Trips Generated		
			In	Out		In	Out	Total
WEEKDAY DAILY								
Aegis Plan: Senior Adult Housing-Attached	347	DU	252	50%	50%	3.44	597	597
Proposed Zoning: Multifamily (Apartments)	195	DU	220	50%	50%	Equation	653	652
WEEKDAY DAILY DIFFERENCE IN TRIPS							56	55
AM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	347	DU	252	34%	66%	Equation	23	46
Proposed Zoning: Multifamily (Apartments)	195	DU	220	20%	80%	Equation	20	79
AM PEAK HOUR DIFFERENCE IN TRIPS							-3	33
PM PEAK HOUR								
Aegis Plan: Senior Adult Housing-Attached	347	DU	252	54%	46%	Equation	46	39
Proposed Zoning: Multifamily (Apartments)	195	DU	220	65%	35%	Equation	81	44
PM PEAK HOUR DIFFERENCE IN TRIPS							35	5
Notes: 1. DU = Dwelling Units. 2. Institute of Transportation Engineers (ITE) Trip Generation manual 9th edition land use code.								

ATTACHMENT B

Level of Service Worksheets

2019 With Project (347 Senior Housing Units)

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	5	33	746	1	265	4	396	0	186	1244	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900	0
Storage Length (ft)	0	0	0	0	0	150	0	0	150	0	0	0
Storage Lanes	0	1	1	1	1	1	0	0	1	0	0	0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		219			262			340			1991	
Travel Time (s)		6.0			7.1			6.6			54.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	8%	8%	8%	3%	3%	3%
Shared Lane Traffic (%)				50%								
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12			12			12		
Link Offset(ft)	0			0			0			0		
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	12.0	63.0		27.0	78.0	
Total Split (%)	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	8.6%	45.0%		19.3%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

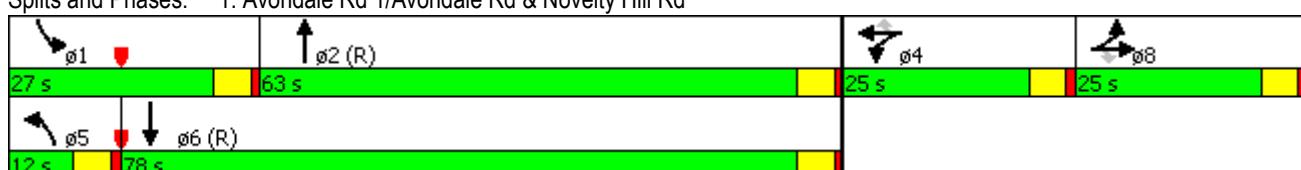
Actuated Cycle Length: 140

Offset: 27 (19%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	5	33	746	1	265	4	396	0	186	1244	10
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1792	1863	1863	1863	1759	1759	0	1845	1553	1900
Adj Flow Rate, veh/h	20	5	31	795	0	71	4	421	0	198	1323	11
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	6	6	6	2	2	2	8	8	0	3	3	3
Cap, veh/h	43	11	48	507	0	226	7	1854	0	226	1972	16
Arrive On Green	0.03	0.03	0.03	0.14	0.00	0.14	0.00	0.18	0.00	0.13	0.66	0.68
Sat Flow, veh/h	1379	345	1524	3548	0	1583	1675	3431	0	1757	3000	25
Grp Volume(v), veh/h	25	0	31	795	0	71	4	421	0	198	651	683
Grp Sat Flow(s), veh/h/ln	1724	0	1524	1774	0	1583	1675	1671	0	1757	1476	1549
Q Serve(g_s), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	15.0	0.0	15.5	37.8	37.8
Cycle Q Clear(g_c), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	15.0	0.0	15.5	37.8	37.8
Prop In Lane	0.80			1.00		1.00				0.00	1.00	0.02
Lane Grp Cap(c), veh/h	54	0	48	507	0	226	7	1854	0	226	970	1018
V/C Ratio(X)	0.46	0.00	0.65	1.57	0.00	0.31	0.58	0.23	0.00	0.88	0.67	0.67
Avail Cap(c_a), veh/h	246	0	218	507	0	226	84	1854	0	276	970	1018
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.79	0.79	0.79
Uniform Delay(d), s/veh	66.7	0.0	67.1	60.0	0.0	53.8	69.8	31.6	0.0	59.9	14.7	14.7
Incr Delay(d2), s/veh	6.1	0.0	14.0	265.3	0.0	0.8	59.3	0.3	0.0	18.7	2.9	2.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.0	0.0	1.4	28.5	0.0	2.5	0.3	7.0	0.0	8.7	16.2	16.9
LnGrp Delay(d), s/veh	72.7	0.0	81.0	325.3	0.0	54.6	129.1	31.9	0.0	78.7	17.6	17.5
LnGrp LOS	E		F		D	F	C		E	B	B	
Approach Vol, veh/h		56			866			425			1532	
Approach Delay, s/veh		77.3			303.1			32.8			25.4	
Approach LOS		E			F		C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	82.6		25.0	5.6	100.0		9.4				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	22.0	58.0		20.0	7.0	73.0		20.0				
Max Q Clear Time (g_c+l1), s	17.5	17.0		22.0	2.3	40.8		4.8				
Green Ext Time (p_c), s	0.5	26.9		0.0	0.0	22.8		0.1				
Intersection Summary												
HCM 2010 Ctrl Delay		111.0										
HCM 2010 LOS			F									
Notes												
User approved volume balancing among the lanes for turning movement.												

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	6	57	56	4	30	4	658	8	9	2002	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		384			667			1512			582	
Travel Time (s)		10.5			18.2			29.5			15.9	
Confl. Peds. (#/hr)												2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	8%	8%	8%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4		4				
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	78.0		11.0	78.0	
Total Split (%)	18.6%	18.6%	18.6%	17.9%	17.9%	17.9%	7.9%	55.7%		7.9%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 137 (98%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



Bear Creek Rezone

2019 347 senior housing AM Peak - 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
2: Avondale Rd 1 & NE 95 St

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	29	6	57	56	4	30	4	658	8	9	2002	7
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1845	1900	1845	1845	1759	1759	1900	1863	1569	1900
Adj Flow Rate, veh/h	32	7	63	62	4	33	4	731	9	10	2224	8
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	8	8	8	2	2	2
Cap, veh/h	79	17	85	85	6	81	7	2509	31	16	2210	8
Arrive On Green	0.05	0.05	0.05	0.05	0.05	0.05	0.01	1.00	1.00	0.01	0.73	0.75
Sat Flow, veh/h	1454	318	1568	1655	107	1568	1675	3382	42	1774	3046	11
Grp Volume(v), veh/h	39	0	63	66	0	33	4	361	379	10	1087	1145
Grp Sat Flow(s), veh/h/ln	1772	0	1568	1762	0	1568	1675	1671	1752	1774	1490	1567
Q Serve(g_s), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Cycle Q Clear(g_c), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Prop In Lane	0.82			1.00	0.94		1.00	1.00		0.02	1.00	0.01
Lane Grp Cap(c), veh/h	96	0	85	91	0	81	7	1240	1300	16	1081	1137
V/C Ratio(X)	0.40	0.00	0.74	0.73	0.00	0.41	0.58	0.29	0.29	0.61	1.01	1.01
Avail Cap(c_a), veh/h	266	0	235	252	0	224	72	1240	1300	76	1081	1137
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay(d), s/veh	64.0	0.0	65.2	65.4	0.0	64.3	69.3	0.0	0.0	69.1	19.2	19.2
Incr Delay(d2), s/veh	2.7	0.0	11.7	10.4	0.0	3.3	58.1	0.6	0.6	31.8	28.8	28.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.5	0.0	2.7	2.8	0.0	1.3	0.3	0.2	0.2	0.5	49.8	52.2
LnGrp Delay(d), s/veh	66.7	0.0	76.9	75.8	0.0	67.6	127.4	0.6	0.6	100.9	48.0	47.6
LnGrp LOS	E		E			E	F	A	A	F	F	F
Approach Vol, veh/h		102			99			744			2242	
Approach Delay, s/veh		73.0			73.1			1.2			48.0	
Approach LOS		E			E			A			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	108.9		12.2	5.6	109.6		12.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	6.0	73.0		20.0	6.0	73.0		21.0				
Max Q Clear Time (g_c+l1), s	2.8	2.0		7.2	2.3	104.6		7.5				
Green Ext Time (p_c), s	0.0	39.4		0.2	0.0	0.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay		38.7										
HCM 2010 LOS			D									

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	0	50	57	0	14	10	669	25	6	2166	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		686			583			2421			1512	
Travel Time (s)		18.7			15.9			47.2			41.2	
Confl. Peds. (#/hr)	5					5			5			7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		5.0	4.0	
Minimum Split (s)	25.0	25.0		26.0	26.0		10.0	25.0		10.0	28.0	
Total Split (s)	26.0	26.0		26.0	26.0		10.0	104.0		10.0	104.0	
Total Split (%)	18.6%	18.6%		18.6%	18.6%		7.1%	74.3%		7.1%	74.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 12 (9%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



Bear Creek Rezone

2019 347 senior housing AM Peak - 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	0	50	57	0	14	10	669	25	6	2166	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99			0.98	0.99		0.98	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1810	1810	1900	1863	1569	1900
Adj Flow Rate, veh/h	9	0	54	62	0	15	11	727	27	7	2354	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	2	2	2
Cap, veh/h	39	9	113	136	5	23	17	2712	101	15	2378	5
Arrive On Green	0.08	0.00	0.08	0.08	0.00	0.08	0.02	1.00	1.00	0.02	1.00	1.00
Sat Flow, veh/h	123	106	1376	1092	61	279	1723	3380	126	1774	3051	6
Grp Volume(v), veh/h	63	0	0	77	0	0	11	370	384	7	1149	1210
Grp Sat Flow(s),veh/h/ln	1605	0	0	1432	0	0	1723	1719	1787	1774	1490	1567
Q Serve(g_s), s	0.0	0.0	0.0	1.8	0.0	0.0	0.9	0.0	0.0	0.5	0.0	0.0
Cycle Q Clear(g_c), s	5.3	0.0	0.0	7.1	0.0	0.0	0.9	0.0	0.0	0.5	0.0	0.0
Prop In Lane	0.14			0.86	0.81		0.19	1.00		0.07	1.00	
Lane Grp Cap(c), veh/h	161	0	0	164	0	0	17	1379	1434	15	1162	1222
V/C Ratio(X)	0.39	0.00	0.00	0.47	0.00	0.00	0.64	0.27	0.27	0.46	0.99	0.99
Avail Cap(c_a), veh/h	265	0	0	257	0	0	62	1379	1434	63	1162	1222
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.98	0.98	0.98	0.17	0.17	0.17
Uniform Delay (d), s/veh	61.4	0.0	0.0	62.2	0.0	0.0	68.4	0.0	0.0	68.5	0.0	0.0
Incr Delay (d2), s/veh	1.5	0.0	0.0	2.1	0.0	0.0	33.0	0.5	0.4	3.6	8.5	8.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	0.0	3.0	0.0	0.0	0.6	0.2	0.2	0.3	2.8	2.9
LnGrp Delay(d),s/veh	63.0	0.0	0.0	64.2	0.0	0.0	101.4	0.5	0.4	72.1	8.5	8.4
LnGrp LOS	E			E			F	A	A	E	A	A
Approach Vol, veh/h		63			77			765			2366	
Approach Delay, s/veh		63.0			64.2			1.9			8.7	
Approach LOS		E			E			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.2	117.3		16.5	6.4	117.1		16.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	99.0		21.0	5.0	99.0		21.0				
Max Q Clear Time (g_c+l1), s	2.5	2.0		7.3	2.9	3.0		9.1				
Green Ext Time (p_c), s	0.0	96.4		0.6	0.0	95.4		0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			9.4									
HCM 2010 LOS			A									

Lanes, Volumes, Timings
4: Avondale Rd 1 & Avondale Way

5/10/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑ ↗	↗		↑↑	↑↑	↗
Volume (vph)	99	1	0	611	2024	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1600	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes			Yes	
Link Speed (mph)	30			35	25	
Link Distance (ft)	1136			883	2421	
Travel Time (s)	25.8			17.2	66.0	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	8%	8%	2%	2%
Shared Lane Traffic (%)						
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	15.0	15.0		125.0	125.0	
Total Split (%)	10.7%	10.7%		89.3%	89.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0		5.0	8.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type:	Other
Cycle Length:	140
Actuated Cycle Length:	140
Offset:	76 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green
Natural Cycle:	70
Control Type:	Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary
4: Avondale Rd 1 & Avondale Way

5/10/2016

Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	99	1	0	611	2024	407		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	0	1759	1569	1863		
Adj Flow Rate, veh/h	102	1	0	630	2087	0		
Adj No. of Lanes	2	1	0	2	2	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	0	8	2	2		
Cap, veh/h	152	70	0	2957	2572	1400		
Arrive On Green	0.04	0.04	0.00	1.00	1.00	0.00		
Sat Flow, veh/h	3442	1583	0	3519	3059	1583		
Grp Volume(v), veh/h	102	1	0	630	2087	0		
Grp Sat Flow(s), veh/h/ln	1721	1583	0	1671	1490	1583		
Q Serve(g_s), s	4.1	0.1	0.0	0.0	0.0	0.0		
Cycle Q Clear(g_c), s	4.1	0.1	0.0	0.0	0.0	0.0		
Prop In Lane	1.00	1.00	0.00			1.00		
Lane Grp Cap(c), veh/h	152	70	0	2957	2572	1400		
V/C Ratio(X)	0.67	0.01	0.00	0.21	0.81	0.00		
Avail Cap(c_a), veh/h	246	113	0	2957	2572	1400		
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00		
Upstream Filter(I)	0.99	0.99	0.00	0.92	0.13	0.00		
Uniform Delay (d), s/veh	65.9	64.0	0.0	0.0	0.0	0.0		
Incr Delay (d2), s/veh	5.0	0.1	0.0	0.2	0.4	0.0		
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%), veh/ln	2.0	0.0	0.0	0.1	0.1	0.0		
LnGrp Delay(d), s/veh	70.9	64.1	0.0	0.2	0.4	0.0		
LnGrp LOS	E	E		A	A			
Approach Vol, veh/h	103			630	2087			
Approach Delay, s/veh	70.9			0.2	0.4			
Approach LOS	E			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		128.8		11.2		128.8		
Change Period (Y+Rc), s		5.0		5.0		5.0		
Max Green Setting (Gmax), s		120.0		10.0		120.0		
Max Q Clear Time (g_c+l1), s		2.0		6.1		3.0		
Green Ext Time (p_c), s		95.9		0.2		95.2		
Intersection Summary								
HCM 2010 Ctrl Delay			2.9					
HCM 2010 LOS			A					

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↓		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↓	
Volume (vph)	6	354	84	750	280	148	75	407	568	219	1597	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	200		0	0		260	150		0	400		120
Storage Lanes	1		0	2		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			35			35			25	
Link Distance (ft)		455			647			504			883	
Travel Time (s)		10.3			12.6			9.8			24.1	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	24			24			12			12		
Link Offset(ft)	0			0			0			0		
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases					8			2				
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	25.0	34.0		25.0	30.0	13.0	11.0	32.5	25.0	13.0	30.5	
Total Split (s)	25.0	34.0		39.0	48.0	31.0	11.0	36.0	39.0	31.0	56.0	
Total Split (%)	17.9%	24.3%		27.9%	34.3%	22.1%	7.9%	25.7%	27.9%	22.1%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.5	5.0	5.0	8.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

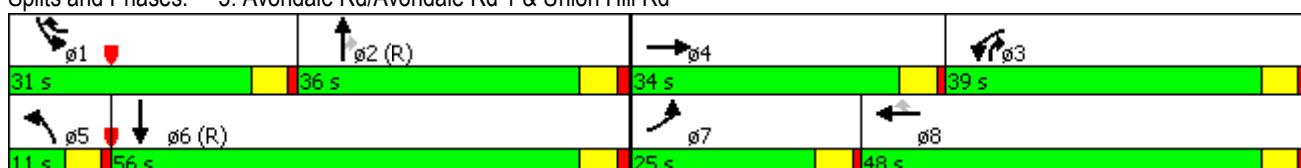
Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 135

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑ ↗	↑ ↘		↖ ↗	↑ ↗	↖ ↗	↖ ↗	↑ ↗	↖ ↗	↖ ↗	↑ ↗	
Volume (veh/h)	6	354	84	750	280	148	75	407	568	219	1597	8
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1776	1776	1776	1810	1810	1810	1863	1569	1900
Adj Flow Rate, veh/h	6	369	88	781	292	94	78	424	516	228	1664	8
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	7	7	7	5	5	5	2	2	2
Cap, veh/h	16	449	106	797	696	814	74	1049	843	262	1709	8
Arrive On Green	0.01	0.16	0.16	0.41	0.65	0.65	0.04	0.31	0.31	0.05	0.13	0.14
Sat Flow, veh/h	1774	2843	671	3281	1776	1509	1723	3438	1538	1774	4399	21
Grp Volume(v), veh/h	6	228	229	781	292	94	78	424	516	228	1080	592
Grp Sat Flow(s), veh/h/ln	1774	1770	1744	1640	1776	1509	1723	1719	1538	1774	1427	1565
Q Serve(g_s), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.7	13.0	17.9	52.8	52.8
Cycle Q Clear(g_c), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.7	13.0	17.9	52.8	52.8
Prop In Lane	1.00			1.00		1.00	1.00			1.00	1.00	0.01
Lane Grp Cap(c), veh/h	16	279	276	797	696	814	74	1049	843	262	1109	608
V/C Ratio(X)	0.38	0.82	0.83	0.98	0.42	0.12	1.06	0.40	0.61	0.87	0.97	0.97
Avail Cap(c_a), veh/h	253	367	361	797	696	814	74	1049	843	329	1109	608
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(l)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	1.00	1.00	0.45	0.45	0.45
Uniform Delay(d), s/veh	69.0	57.0	57.1	41.3	16.6	8.8	67.0	38.6	7.5	65.3	60.3	60.3
Incr Delay(d2), s/veh	14.3	10.4	11.8	24.0	0.3	0.1	121.0	1.2	3.3	9.2	12.9	18.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.3	9.4	9.5	17.5	5.3	1.1	5.3	6.6	6.5	9.5	22.9	26.1
LnGrp Delay(d), s/veh	83.3	67.3	69.0	65.2	16.9	8.8	189.3	39.7	10.8	74.4	73.2	79.2
LnGrp LOS	F	E	E	E	B	A	F	D	B	E	E	E
Approach Vol, veh/h		463			1167			1018			1900	
Approach Delay, s/veh		68.3			48.6			36.5			75.2	
Approach LOS		E			D			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.7	48.2	39.0	27.1	11.0	62.9	6.2	59.9				
Change Period (Y+Rc), s	5.0	5.5	5.0	5.0	5.0	5.5	5.0	5.0				
Max Green Setting (Gmax), s	26.0	30.5	34.0	29.0	6.0	50.5	20.0	43.0				
Max Q Clear Time (g_c+l1), s	19.9	15.7	34.9	19.8	8.0	55.8	2.5	13.0				
Green Ext Time (p_c), s	0.8	13.8	0.0	2.3	0.0	0.0	0.0	11.9				
Intersection Summary												
HCM 2010 Ctrl Delay		59.0										
HCM 2010 LOS			E									
Notes												
User approved ignoring U-Turning movement.												

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	4	22	380	2	306	29	1557	0	231	885	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		174			206			383			2033	
Travel Time (s)		4.7			5.6			10.4			34.7	
Confl. Peds. (#/hr)			3									
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)			50%									
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8		8				
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	35.0	35.0	35.0	18.0	76.0		24.0	82.0	
Total Split (%)	15.6%	15.6%	15.6%	21.9%	21.9%	21.9%	11.3%	47.5%		15.0%	51.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max							

Intersection Summary

Area Type: Other

Cycle Length: 160

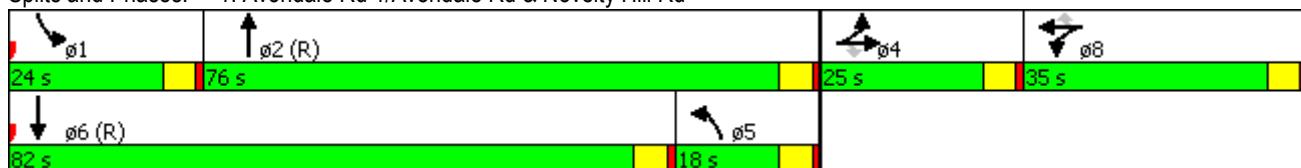
Actuated Cycle Length: 160

Offset: 14 (9%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	4	22	380	2	306	29	1557	0	231	885	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1881	1584	0	1863	1863	1900
Adj Flow Rate, veh/h	11	4	0	389	0	71	30	1589	0	236	903	19
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	0	2	2	2
Cap, veh/h	25	9	30	485	0	217	429	1756	0	211	1706	36
Arrive On Green	0.02	0.02	0.00	0.14	0.00	0.14	0.16	0.39	0.00	0.12	0.48	0.48
Sat Flow, veh/h	1344	489	1615	3583	0	1599	1792	3089	0	1774	3545	75
Grp Volume(v), veh/h	15	0	0	389	0	71	30	1589	0	236	451	471
Grp Sat Flow(s), veh/h/ln	1833	0	1615	1792	0	1599	1792	1505	0	1774	1770	1850
Q Serve(g_s), s	1.3	0.0	0.0	16.8	0.0	6.4	2.3	79.6	0.0	19.0	28.4	28.4
Cycle Q Clear(g_c), s	1.3	0.0	0.0	16.8	0.0	6.4	2.3	79.6	0.0	19.0	28.4	28.4
Prop In Lane	0.73			1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.04	
Lane Grp Cap(c), veh/h	34	0	30	485	0	217	429	1756	0	211	852	890
V/C Ratio(X)	0.44	0.00	0.00	0.80	0.00	0.33	0.07	0.91	0.00	1.12	0.53	0.53
Avail Cap(c_a), veh/h	229	0	202	672	0	300	429	1756	0	211	852	890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.90	0.90	0.90
Uniform Delay(d), s/veh	77.7	0.0	0.0	67.1	0.0	62.6	52.0	44.6	0.0	70.5	28.9	28.9
Incr Delay(d2), s/veh	8.5	0.0	0.0	4.8	0.0	0.9	0.1	8.2	0.0	94.9	2.1	2.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	0.0	8.7	0.0	2.9	1.1	35.1	0.0	14.9	14.4	15.0
LnGrp Delay(d), s/veh	86.1	0.0	0.0	71.9	0.0	63.5	52.1	52.8	0.0	165.4	31.0	30.9
LnGrp LOS	F			E		E	D	D		F	C	C
Approach Vol, veh/h		15			460			1619			1158	
Approach Delay, s/veh		86.1			70.6			52.7			58.4	
Approach LOS		F			E			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.0	101.3		8.0	43.3	82.0		26.7				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	71.0		20.0	13.0	77.0		30.0				
Max Q Clear Time (g_c+l1), s	21.0	82.6		3.3	4.3	30.4		18.8				
Green Ext Time (p_c), s	0.0	0.0		0.0	7.6	10.2		2.8				
Intersection Summary												
HCM 2010 Ctrl Delay		57.4										
HCM 2010 LOS			E									
Notes												
User approved volume balancing among the lanes for turning movement.												

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	0	27	28	8	60	33	2096	83	66	1111	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		388			644			1512			538	
Travel Time (s)		10.6			17.6			41.2			9.2	
Confl. Peds. (#/hr)			2						2			3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	25.0		11.0	25.0	
Total Split (s)	19.0	19.0	19.0	23.0	23.0	23.0	15.0	102.0		16.0	103.0	
Total Split (%)	11.9%	11.9%	11.9%	14.4%	14.4%	14.4%	9.4%	63.8%		10.0%	64.4%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 131 (82%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



HCM 2010 Signalized Intersection Summary
2: Avondale Rd 1 & NE 95 St

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	0	27	28	8	60	33	2096	83	66	1111	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1881	1584	1900	1845	1845	1900
Adj Flow Rate, veh/h	16	0	27	28	8	61	33	2117	84	67	1122	18
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	3	3	3
Cap, veh/h	51	0	44	71	20	81	330	2155	85	84	2162	35
Arrive On Green	0.03	0.00	0.03	0.05	0.05	0.05	0.37	1.00	1.00	0.05	0.61	0.61
Sat Flow, veh/h	1810	0	1580	1422	406	1615	1792	2952	116	1757	3530	57
Grp Volume(v), veh/h	16	0	27	36	0	61	33	1072	1129	67	557	583
Grp Sat Flow(s), veh/h/ln	1810	0	1580	1829	0	1615	1792	1505	1563	1757	1752	1835
Q Serve(g_s), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	28.9	28.9
Cycle Q Clear(g_c), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	28.9	28.9
Prop In Lane	1.00			1.00	0.78		1.00	1.00		0.07	1.00	0.03
Lane Grp Cap(c), veh/h	51	0	44	92	0	81	330	1099	1142	84	1073	1124
V/C Ratio(X)	0.32	0.00	0.61	0.39	0.00	0.75	0.10	0.98	0.99	0.80	0.52	0.52
Avail Cap(c_a), veh/h	158	0	138	206	0	182	330	1099	1142	121	1073	1124
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.24	0.24	0.24	1.00	1.00	1.00
Uniform Delay (d), s/veh	76.2	0.0	76.9	73.6	0.0	75.0	41.8	0.0	0.0	75.4	17.6	17.6
Incr Delay (d2), s/veh	3.5	0.0	12.7	2.7	0.0	13.1	0.0	8.8	10.7	20.6	1.8	1.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	1.3	1.6	0.0	3.0	1.0	2.7	3.4	3.4	14.5	15.1
LnGrp Delay(d), s/veh	79.7	0.0	89.6	76.3	0.0	88.1	41.8	8.8	10.7	96.0	19.4	19.3
LnGrp LOS	E		F	E		F	D	A	B	F	B	B
Approach Vol, veh/h		43			97			2234			1207	
Approach Delay, s/veh		85.9			83.7			10.3			23.6	
Approach LOS		F			F			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.7	124.8		9.5	34.5	103.0		13.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	97.0		14.0	10.0	98.0		18.0				
Max Q Clear Time (g_c+l1), s	8.0	3.0		4.7	3.9	30.9		8.0				
Green Ext Time (p_c), s	0.0	29.2		0.0	4.8	5.5		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay		17.7										
HCM 2010 LOS			B									
Notes												
User approved pedestrian interval to be less than phase max green.												

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	0	25	43	0	11	39	2212	58	14	1221	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		682			396			2418			1512	
Travel Time (s)		18.6			10.8			65.9			25.8	
Confl. Peds. (#/hr)	5					5			5			5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		26.0	26.0		10.0	25.0		10.0	25.0	
Total Split (s)	27.0	27.0		27.0	27.0		14.0	123.0		10.0	119.0	
Total Split (%)	16.9%	16.9%		16.9%	16.9%		8.8%	76.9%		6.3%	74.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0			0.0			0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	8.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 86 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



HCM 2010 Signalized Intersection Summary
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	0	25	43	0	11	39	2212	58	14	1221	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1881	1584	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	0	26	45	0	12	41	2328	61	15	1285	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	48	12	71	112	5	20	53	2433	63	22	2940	11
Arrive On Green	0.06	0.00	0.06	0.06	0.00	0.06	0.06	1.00	1.00	0.02	1.00	1.00
Sat Flow, veh/h	289	185	1120	1125	74	320	1792	2997	78	1774	3616	14
Grp Volume(v), veh/h	37	0	0	57	0	0	41	1164	1225	15	629	661
Grp Sat Flow(s), veh/h/ln	1594	0	0	1519	0	0	1792	1505	1570	1774	1770	1860
Q Serve(g_s), s	0.0	0.0	0.0	1.9	0.0	0.0	3.6	0.0	0.0	1.3	0.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	0.0	5.4	0.0	0.0	3.6	0.0	0.0	1.3	0.0	0.0
Prop In Lane	0.30		0.70	0.79		0.21	1.00		0.05	1.00		0.01
Lane Grp Cap(c), veh/h	130	0	0	137	0	0	53	1222	1275	22	1439	1513
V/C Ratio(X)	0.28	0.00	0.00	0.42	0.00	0.00	0.77	0.95	0.96	0.70	0.44	0.44
Avail Cap(c_a), veh/h	241	0	0	240	0	0	101	1222	1275	55	1439	1513
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.22	0.22	0.22	0.91	0.91	0.91
Uniform Delay (d), s/veh	71.8	0.0	0.0	72.6	0.0	0.0	74.8	0.0	0.0	77.8	0.0	0.0
Incr Delay (d2), s/veh	1.2	0.0	0.0	2.0	0.0	0.0	5.3	5.3	5.8	30.6	0.9	0.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.6	0.0	0.0	2.5	0.0	0.0	1.9	1.8	2.1	0.8	0.4	0.4
LnGrp Delay(d), s/veh	73.0	0.0	0.0	74.6	0.0	0.0	80.1	5.3	5.8	108.3	0.9	0.8
LnGrp LOS	E		E			F	A	A	F	A	A	
Approach Vol, veh/h		37			57			2430			1305	
Approach Delay, s/veh		73.0			74.6			6.8			2.1	
Approach LOS		E			E			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.9	137.9		15.2	9.7	135.1		15.2				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	118.0		22.0	9.0	114.0		22.0				
Max Q Clear Time (g_c+l1), s	3.3	3.0		5.5	5.6	2.0		7.4				
Green Ext Time (p_c), s	0.0	114.3		0.4	0.0	111.3		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			6.8									
HCM 2010 LOS			A									

Lanes, Volumes, Timings
4: Avondale Rd 1 & Avondale Way

5/10/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑	↑↑	↑↑
Volume (vph)	699	47	0	1810	962	427
Ideal Flow (vphpl)	1900	1900	1900	1600	1900	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes			Yes	
Link Speed (mph)	30			25	40	
Link Distance (ft)	533			872	2418	
Travel Time (s)	12.1			23.8	41.2	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Shared Lane Traffic (%)						
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.24	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	58.0	58.0		102.0	102.0	
Total Split (%)	36.3%	36.3%		63.8%	63.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		3.0	0.0	
Total Lost Time (s)	5.0	5.0		8.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type:	Other
Cycle Length:	160
Actuated Cycle Length:	160
Offset:	1 (1%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary
4: Avondale Rd 1 & Avondale Way

5/10/2016

Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	699	47	0	1810	962	427		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1881	0	1584	1863	1863		
Adj Flow Rate, veh/h	752	51	0	1946	1034	0		
Adj No. of Lanes	2	1	0	2	2	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	1	0	1	2	2		
Cap, veh/h	904	416	0	1982	2397	1072		
Arrive On Green	0.26	0.26	0.00	0.88	0.22	0.00		
Sat Flow, veh/h	3476	1599	0	3168	3632	1583		
Grp Volume(v), veh/h	752	51	0	1946	1034	0		
Grp Sat Flow(s), veh/h/ln	1738	1599	0	1505	1770	1583		
Q Serve(g_s), s	32.7	3.9	0.0	91.6	40.2	0.0		
Cycle Q Clear(g_c), s	32.7	3.9	0.0	91.6	40.2	0.0		
Prop In Lane	1.00	1.00	0.00			1.00		
Lane Grp Cap(c), veh/h	904	416	0	1982	2397	1072		
V/C Ratio(X)	0.83	0.12	0.00	0.98	0.43	0.00		
Avail Cap(c_a), veh/h	1151	530	0	1982	2397	1072		
HCM Platoon Ratio	1.00	1.00	1.00	1.33	0.33	0.33		
Upstream Filter(l)	1.00	1.00	0.00	0.31	0.90	0.00		
Uniform Delay (d), s/veh	55.9	45.2	0.0	9.1	35.6	0.0		
Incr Delay (d2), s/veh	4.2	0.1	0.0	7.8	0.5	0.0		
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%), veh/ln	16.2	1.7	0.0	38.2	19.9	0.0		
LnGrp Delay(d), s/veh	60.1	45.4	0.0	16.9	36.1	0.0		
LnGrp LOS	E	D		B	D			
Approach Vol, veh/h	803			1946	1034			
Approach Delay, s/veh	59.2			16.9	36.1			
Approach LOS	E			B	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s	113.4			46.6		113.4		
Change Period (Y+Rc), s	5.0			5.0		5.0		
Max Green Setting (Gmax), s	97.0			53.0		97.0		
Max Q Clear Time (g_c+l1), s	94.6			34.7		42.2		
Green Ext Time (p_c), s	2.4			6.9		50.6		
Intersection Summary								
HCM 2010 Ctrl Delay			31.1					
HCM 2010 LOS			C					

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑↑	↑	↑	↑	↑↑	↑	↑↑	↑↑↑	
Volume (vph)	4	587	29	447	446	463	98	1323	1042	251	630	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	200		0	0		260	150		0	400		120
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			35			25			40	
Link Distance (ft)		465			621			484			872	
Travel Time (s)		10.6			12.1			13.2			14.9	
Confl. Peds. (#/hr)			8			4			4			
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8			2			
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	20.0	34.0		25.0	30.0	18.0	12.0	40.0	25.0	18.0	40.0	
Total Split (s)	18.0	33.0		25.0	40.0	22.0	40.0	80.0	25.0	22.0	62.0	
Total Split (%)	11.3%	20.6%		15.6%	25.0%	13.8%	25.0%	50.0%	15.6%	13.8%	38.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	8.5	5.0	5.0	5.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	
Lead-Lag Optimize?					Yes	Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

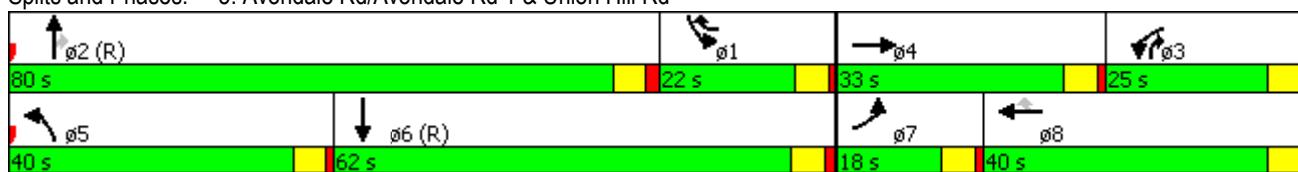
Actuated Cycle Length: 160

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		
Volume (veh/h)	4	587	29	447	446	463	98	1323	1042	251	630	18	
Number	7	4	14	3	8	18	5	2	12	1	6	16	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00			0.99	1.00		1.00		1.00	1.00		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1569	1863	1827	1827	1900	
Adj Flow Rate, veh/h	4	593	29	452	451	366	99	1336	1018	254	636	18	
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	4	4	4	
Cap, veh/h	11	601	29	430	547	795	123	1332	933	364	3035	86	
Arrive On Green	0.01	0.17	0.17	0.13	0.29	0.29	0.07	0.45	0.47	0.07	0.20	0.20	
Sat Flow, veh/h	1774	3432	168	3442	1863	1577	1774	2980	1579	1740	4986	141	
Grp Volume(v), veh/h	4	305	317	452	451	366	99	1336	1018	254	424	230	
Grp Sat Flow(s), veh/h/ln	1774	1770	1830	1721	1863	1577	1774	1490	1579	1740	1663	1802	
Q Serve(g_s), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	71.5	74.5	22.8	17.0	17.1	
Cycle Q Clear(g_c), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	71.5	74.5	22.8	17.0	17.1	
Prop In Lane	1.00			0.09	1.00		1.00	1.00		1.00	1.00	0.08	
Lane Grp Cap(c), veh/h	11	310	320	430	547	795	123	1332	933	364	2023	1097	
V/C Ratio(X)	0.37	0.99	0.99	1.05	0.82	0.46	0.80	1.00	1.09	0.70	0.21	0.21	
Avail Cap(c_a), veh/h	144	310	320	430	547	795	388	1332	933	364	2023	1097	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	
Upstream Filter(l)	1.00	1.00	1.00	0.81	0.81	0.81	1.00	1.00	1.00	0.91	0.91	0.91	
Uniform Delay(d), s/veh	79.2	65.8	65.8	70.0	52.6	26.2	73.4	44.2	32.7	69.5	31.8	31.8	
Incr Delay(d2), s/veh	19.6	47.2	47.0	53.0	8.2	0.3	4.5	25.4	57.4	5.5	0.2	0.4	
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%), veh/ln	0.2	17.5	18.2	12.7	19.8	10.4	4.5	34.1	47.2	11.6	7.9	8.7	
LnGrp Delay(d), s/veh	98.8	113.0	112.8	123.0	60.8	26.5	77.9	69.7	90.1	75.0	32.0	32.2	
LnGrp LOS	F	F	F	F	E	C	E	F	F	E	C	C	
Approach Vol, veh/h		626			1269			2453			908		
Approach Delay, s/veh		112.8			73.0			78.5			44.1		
Approach LOS		F			E			E			D		
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc), s	39.5	80.0	25.0	33.0	16.1	103.4	6.0	52.0					
Change Period (Y+Rc), s	5.5	* 5.5	5.0	5.0	5.0	5.5	5.0	5.0					
Max Green Setting (Gmax), s	17.0	* 75	20.0	28.0	35.0	56.5	13.0	35.0					
Max Q Clear Time (g_c+l1), s	24.8	76.5	22.0	29.6	10.8	20.0	2.4	38.1					
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.5	8.7	0.0	0.0					
Intersection Summary													
HCM 2010 Ctrl Delay			75.3										
HCM 2010 LOS			E										
Notes													
User approved pedestrian interval to be less than phase max green.													
User approved ignoring U-Turning movement.													
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.													

2019 With Project (155 Senior Housing Units)

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	5	33	746	1	265	4	392	0	186	1243	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0	0	0	0	0	150	0	0	150	0	0	0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		219			262			340			1991	
Travel Time (s)		6.0			7.1			6.6			54.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	8%	8%	8%	3%	3%	3%
Shared Lane Traffic (%)				50%								
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12			12			12		
Link Offset(ft)	0			0			0			0		
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	12.0	63.0		27.0	78.0	
Total Split (%)	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	8.6%	45.0%		19.3%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 27 (19%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	5	33	746	1	265	4	392	0	186	1243	10
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1792	1863	1863	1863	1759	1759	0	1845	1553	1900
Adj Flow Rate, veh/h	20	5	31	795	0	71	4	417	0	198	1322	11
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	6	6	6	2	2	2	8	8	0	3	3	3
Cap, veh/h	43	11	48	507	0	226	7	1854	0	226	1972	16
Arrive On Green	0.03	0.03	0.03	0.14	0.00	0.14	0.00	0.18	0.00	0.13	0.66	0.68
Sat Flow, veh/h	1379	345	1524	3548	0	1583	1675	3431	0	1757	3000	25
Grp Volume(v), veh/h	25	0	31	795	0	71	4	417	0	198	650	683
Grp Sat Flow(s), veh/h/ln	1724	0	1524	1774	0	1583	1675	1671	0	1757	1476	1549
Q Serve(g_s), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	14.9	0.0	15.5	37.8	37.8
Cycle Q Clear(g_c), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	14.9	0.0	15.5	37.8	37.8
Prop In Lane	0.80			1.00		1.00				0.00	1.00	0.02
Lane Grp Cap(c), veh/h	54	0	48	507	0	226	7	1854	0	226	970	1018
V/C Ratio(X)	0.46	0.00	0.65	1.57	0.00	0.31	0.58	0.22	0.00	0.88	0.67	0.67
Avail Cap(c_a), veh/h	246	0	218	507	0	226	84	1854	0	276	970	1018
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.79	0.79	0.79
Uniform Delay(d), s/veh	66.7	0.0	67.1	60.0	0.0	53.8	69.8	31.6	0.0	59.9	14.7	14.7
Incr Delay(d2), s/veh	6.1	0.0	14.0	265.3	0.0	0.8	59.3	0.3	0.0	18.7	2.9	2.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.0	0.0	1.4	28.5	0.0	2.5	0.3	7.0	0.0	8.7	16.1	16.9
LnGrp Delay(d), s/veh	72.7	0.0	81.0	325.3	0.0	54.6	129.1	31.8	0.0	78.7	17.6	17.5
LnGrp LOS	E		F		D	F	C		E	B	B	
Approach Vol, veh/h		56			866			421			1531	
Approach Delay, s/veh		77.3			303.1			32.8			25.4	
Approach LOS		E			F		C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	82.6		25.0	5.6	100.0		9.4				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	22.0	58.0		20.0	7.0	73.0		20.0				
Max Q Clear Time (g_c+l1), s	17.5	16.9		22.0	2.3	40.8		4.8				
Green Ext Time (p_c), s	0.5	26.9		0.0	0.0	22.7		0.1				
Intersection Summary												
HCM 2010 Ctrl Delay		111.2										
HCM 2010 LOS			F									
Notes												
User approved volume balancing among the lanes for turning movement.												

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	6	57	56	4	30	4	653	8	9	2001	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		384			667			1512			582	
Travel Time (s)		10.5			18.2			29.5			15.9	
Confl. Peds. (#/hr)												2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	8%	8%	8%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4		4				
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	78.0		11.0	78.0	
Total Split (%)	18.6%	18.6%	18.6%	17.9%	17.9%	17.9%	7.9%	55.7%		7.9%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 137 (98%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



Bear Creek Rezone

2019 155 senior housing AM Peak - 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
2: Avondale Rd 1 & NE 95 St

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	29	6	57	56	4	30	4	653	8	9	2001	7
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1845	1900	1845	1845	1759	1759	1900	1863	1569	1900
Adj Flow Rate, veh/h	32	7	63	62	4	33	4	726	9	10	2223	8
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	8	8	8	2	2	2
Cap, veh/h	79	17	85	85	6	81	7	2509	31	16	2210	8
Arrive On Green	0.05	0.05	0.05	0.05	0.05	0.05	0.01	1.00	1.00	0.01	0.73	0.75
Sat Flow, veh/h	1454	318	1568	1655	107	1568	1675	3381	42	1774	3046	11
Grp Volume(v), veh/h	39	0	63	66	0	33	4	359	376	10	1087	1144
Grp Sat Flow(s),veh/h/ln	1772	0	1568	1762	0	1568	1675	1671	1752	1774	1490	1567
Q Serve(g_s), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Cycle Q Clear(g_c), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Prop In Lane	0.82			1.00	0.94		1.00	1.00		0.02	1.00	0.01
Lane Grp Cap(c), veh/h	96	0	85	91	0	81	7	1240	1300	16	1081	1137
V/C Ratio(X)	0.40	0.00	0.74	0.73	0.00	0.41	0.58	0.29	0.29	0.61	1.01	1.01
Avail Cap(c_a), veh/h	266	0	235	252	0	224	72	1240	1300	76	1081	1137
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00
Uniform Delay(d), s/veh	64.0	0.0	65.2	65.4	0.0	64.3	69.3	0.0	0.0	69.1	19.2	19.2
Incr Delay(d2), s/veh	2.7	0.0	11.7	10.4	0.0	3.3	58.2	0.6	0.6	31.8	28.6	28.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	2.7	2.8	0.0	1.3	0.3	0.2	0.2	0.5	49.7	52.2
LnGrp Delay(d),s/veh	66.7	0.0	76.9	75.8	0.0	67.6	127.5	0.6	0.6	100.9	47.9	47.5
LnGrp LOS	E		E			E	F	A	A	F	F	F
Approach Vol, veh/h		102				99			739		2241	
Approach Delay, s/veh		73.0				73.1			1.3		47.9	
Approach LOS		E				E			A		D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	108.9		12.2	5.6	109.6		12.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	6.0	73.0		20.0	6.0	73.0		21.0				
Max Q Clear Time (g_c+l1), s	2.8	2.0		7.2	2.3	104.6		7.5				
Green Ext Time (p_c), s	0.0	39.3		0.2	0.0	0.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			38.7									
HCM 2010 LOS			D									

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	0	50	36	0	9	10	669	14	5	2166	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		686			583			2421			1512	
Travel Time (s)		18.7			15.9			47.2			41.2	
Confl. Peds. (#/hr)	5					5			5			7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		5.0	4.0	
Minimum Split (s)	25.0	25.0		26.0	26.0		10.0	25.0		10.0	28.0	
Total Split (s)	26.0	26.0		26.0	26.0		10.0	104.0		10.0	104.0	
Total Split (%)	18.6%	18.6%		18.6%	18.6%		7.1%	74.3%		7.1%	74.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 12 (9%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



Bear Creek Rezone

2019 155 senior housing AM Peak - 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	0	50	36	0	9	10	669	14	5	2166	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98			0.98		0.98	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1810	1810	1900	1863	1569	1900
Adj Flow Rate, veh/h	9	0	54	39	0	10	11	727	15	5	2354	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	2	2	2
Cap, veh/h	38	6	88	116	5	19	17	2829	58	11	2429	5
Arrive On Green	0.07	0.00	0.07	0.07	0.00	0.07	0.02	1.00	1.00	0.01	1.00	1.00
Sat Flow, veh/h	128	96	1342	1070	80	295	1723	3445	71	1774	3051	6
Grp Volume(v), veh/h	63	0	0	49	0	0	11	363	379	5	1149	1210
Grp Sat Flow(s),veh/h/ln	1566	0	0	1445	0	0	1723	1719	1797	1774	1490	1567
Q Serve(g_s), s	1.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.4	0.0	0.0
Cycle Q Clear(g_c), s	5.4	0.0	0.0	4.4	0.0	0.0	0.9	0.0	0.0	0.4	0.0	0.0
Prop In Lane	0.14			0.86	0.80		0.20	1.00		0.04	1.00	
Lane Grp Cap(c), veh/h	132	0	0	141	0	0	17	1412	1475	11	1186	1248
V/C Ratio(X)	0.48	0.00	0.00	0.35	0.00	0.00	0.64	0.26	0.26	0.45	0.97	0.97
Avail Cap(c_a), veh/h	260	0	0	256	0	0	62	1412	1475	63	1186	1248
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.98	0.98	0.98	0.17	0.17	0.17
Uniform Delay (d), s/veh	63.7	0.0	0.0	63.2	0.0	0.0	68.4	0.0	0.0	68.9	0.0	0.0
Incr Delay (d2), s/veh	2.7	0.0	0.0	1.5	0.0	0.0	33.0	0.4	0.4	4.6	5.6	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	0.0	1.9	0.0	0.0	0.6	0.2	0.2	0.2	1.8	1.9
LnGrp Delay(d),s/veh	66.3	0.0	0.0	64.6	0.0	0.0	101.4	0.4	0.4	73.5	5.6	5.5
LnGrp LOS	E			E			F	A	A	E	A	A
Approach Vol, veh/h		63			49			753			2364	
Approach Delay, s/veh		66.3			64.6			1.9			5.7	
Approach LOS		E			E			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.9	120.0		14.2	6.4	119.5		14.2				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	99.0		21.0	5.0	99.0		21.0				
Max Q Clear Time (g_c+l1), s	2.4	2.0		7.4	2.9	3.0		6.4				
Green Ext Time (p_c), s	0.0	96.4		0.5	0.0	95.4		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay		6.9										
HCM 2010 LOS			A									

Lanes, Volumes, Timings
4: Avondale Rd 1 & Avondale Way

5/10/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑ ↗	↗		↑↑	↑↑	↗
Volume (vph)	96	1	0	603	2008	402
Ideal Flow (vphpl)	1900	1900	1900	1900	1600	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes			Yes	
Link Speed (mph)	30			35	25	
Link Distance (ft)	1136			883	2421	
Travel Time (s)	25.8			17.2	66.0	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	8%	8%	2%	2%
Shared Lane Traffic (%)						
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	15.0	15.0		125.0	125.0	
Total Split (%)	10.7%	10.7%		89.3%	89.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0		5.0	8.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type:	Other
Cycle Length:	140
Actuated Cycle Length:	140
Offset:	76 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green
Natural Cycle:	70
Control Type:	Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary
4: Avondale Rd 1 & Avondale Way

5/10/2016

Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	96	1	0	603	2008	402		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	0	1759	1569	1863		
Adj Flow Rate, veh/h	99	1	0	622	2070	0		
Adj No. of Lanes	2	1	0	2	2	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	0	8	2	2		
Cap, veh/h	148	68	0	2960	2575	1402		
Arrive On Green	0.04	0.04	0.00	1.00	1.00	0.00		
Sat Flow, veh/h	3442	1583	0	3519	3059	1583		
Grp Volume(v), veh/h	99	1	0	622	2070	0		
Grp Sat Flow(s), veh/h/ln	1721	1583	0	1671	1490	1583		
Q Serve(g_s), s	4.0	0.1	0.0	0.0	0.0	0.0		
Cycle Q Clear(g_c), s	4.0	0.1	0.0	0.0	0.0	0.0		
Prop In Lane	1.00	1.00	0.00			1.00		
Lane Grp Cap(c), veh/h	148	68	0	2960	2575	1402		
V/C Ratio(X)	0.67	0.01	0.00	0.21	0.80	0.00		
Avail Cap(c_a), veh/h	246	113	0	2960	2575	1402		
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00		
Upstream Filter(I)	0.99	0.99	0.00	0.93	0.21	0.00		
Uniform Delay (d), s/veh	66.0	64.1	0.0	0.0	0.0	0.0		
Incr Delay (d2), s/veh	5.0	0.1	0.0	0.2	0.6	0.0		
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%), veh/ln	2.0	0.0	0.0	0.1	0.2	0.0		
LnGrp Delay(d), s/veh	71.0	64.2	0.0	0.2	0.6	0.0		
LnGrp LOS	E	E		A	A			
Approach Vol, veh/h	100			622	2070			
Approach Delay, s/veh	70.9			0.2	0.6			
Approach LOS	E			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s	129.0		11.0		129.0			
Change Period (Y+Rc), s	5.0		5.0		5.0			
Max Green Setting (Gmax), s	120.0		10.0		120.0			
Max Q Clear Time (g_c+l1), s	2.0		6.0		3.0			
Green Ext Time (p_c), s	94.9		0.2		94.3			
Intersection Summary								
HCM 2010 Ctrl Delay			3.0					
HCM 2010 LOS			A					

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↓		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↓	
Volume (vph)	6	354	84	750	280	147	75	400	568	216	1584	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	200		0	0		260	150		0	400		120
Storage Lanes	1		0	2		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			35			35			25	
Link Distance (ft)		455			647			504			883	
Travel Time (s)		10.3			12.6			9.8			24.1	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	24			24			12			12		
Link Offset(ft)	0			0			0			0		
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases					8			2				
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	25.0	34.0		25.0	30.0	13.0	11.0	32.5	25.0	13.0	30.5	
Total Split (s)	25.0	34.0		39.0	48.0	31.0	11.0	36.0	39.0	31.0	56.0	
Total Split (%)	17.9%	24.3%		27.9%	34.3%	22.1%	7.9%	25.7%	27.9%	22.1%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.5	5.0	5.0	8.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

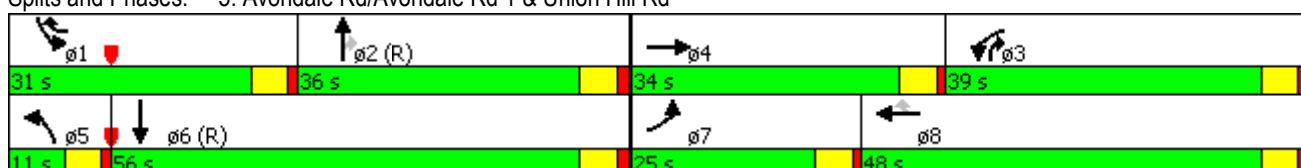
Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 135

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑ ↗	↑ ↘		↖ ↗	↑ ↗	↖ ↗	↖ ↗	↑ ↗	↖ ↗	↖ ↗	↑ ↗	
Volume (veh/h)	6	354	84	750	280	147	75	400	568	216	1584	8
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1776	1776	1776	1810	1810	1810	1863	1569	1900
Adj Flow Rate, veh/h	6	369	88	781	292	93	78	417	516	225	1650	8
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	7	7	7	5	5	5	2	2	2
Cap, veh/h	16	449	106	797	696	812	74	1054	845	259	1709	8
Arrive On Green	0.01	0.16	0.16	0.41	0.65	0.65	0.04	0.31	0.31	0.05	0.13	0.14
Sat Flow, veh/h	1774	2843	671	3281	1776	1509	1723	3438	1538	1774	4398	21
Grp Volume(v), veh/h	6	228	229	781	292	93	78	417	516	225	1071	587
Grp Sat Flow(s), veh/h/ln	1774	1770	1744	1640	1776	1509	1723	1719	1538	1774	1427	1565
Q Serve(g_s), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.4	12.9	17.6	52.3	52.3
Cycle Q Clear(g_c), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.4	12.9	17.6	52.3	52.3
Prop In Lane	1.00		0.38	1.00		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	16	279	276	797	696	812	74	1054	845	259	1109	608
V/C Ratio(X)	0.38	0.82	0.83	0.98	0.42	0.11	1.06	0.40	0.61	0.87	0.97	0.97
Avail Cap(c_a), veh/h	253	367	361	797	696	812	74	1054	845	329	1109	608
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(l)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	1.00	1.00	0.46	0.46	0.46
Uniform Delay(d), s/veh	69.0	57.0	57.1	41.3	16.6	8.8	67.0	38.3	7.4	65.3	60.1	60.1
Incr Delay(d2), s/veh	14.3	10.4	11.8	24.0	0.3	0.1	121.0	1.1	3.3	9.1	11.9	17.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.3	9.4	9.5	17.5	5.3	1.0	5.3	6.5	6.5	9.3	22.5	25.7
LnGrp Delay(d), s/veh	83.3	67.3	69.0	65.2	16.9	8.9	189.3	39.4	10.7	74.4	72.0	77.9
LnGrp LOS	F	E	E	E	B	A	F	D	B	E	E	E
Approach Vol, veh/h		463			1166			1011			1883	
Approach Delay, s/veh		68.3			48.7			36.3			74.1	
Approach LOS		E			D			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.5	48.4	39.0	27.1	11.0	62.9	6.2	59.9				
Change Period (Y+Rc), s	5.0	5.5	5.0	5.0	5.0	5.5	5.0	5.0				
Max Green Setting (Gmax), s	26.0	30.5	34.0	29.0	6.0	50.5	20.0	43.0				
Max Q Clear Time (g_c+l1), s	19.6	15.4	34.9	19.8	8.0	55.3	2.5	13.0				
Green Ext Time (p_c), s	0.8	14.0	0.0	2.3	0.0	0.0	0.0	11.9				
Intersection Summary												
HCM 2010 Ctrl Delay		58.5										
HCM 2010 LOS			E									
Notes												
User approved ignoring U-Turning movement.												

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	4	22	379	2	306	29	1554	0	231	881	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0	0	0	0	0	0	150	0	150	0	150	0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		174			206			383			2033	
Travel Time (s)		4.7			5.6			10.4			34.7	
Confl. Peds. (#/hr)			3									
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)			50%									
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	35.0	35.0	35.0	18.0	76.0		24.0	82.0	
Total Split (%)	15.6%	15.6%	15.6%	21.9%	21.9%	21.9%	11.3%	47.5%		15.0%	51.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max							

Intersection Summary

Area Type: Other

Cycle Length: 160

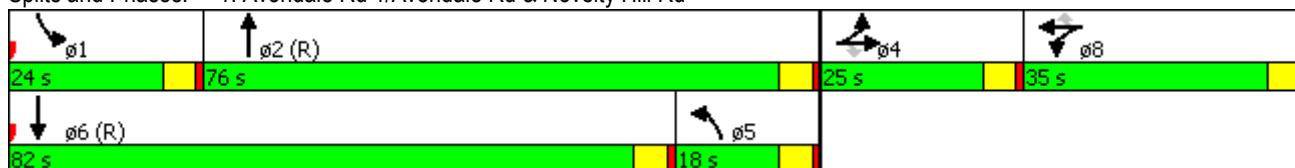
Actuated Cycle Length: 160

Offset: 14 (9%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



Bear Creek Rezone

2019 With A155 senior housing PM Peak 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	4	22	379	2	306	29	1554	0	231	881	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1881	1584	0	1863	1863	1900
Adj Flow Rate, veh/h	11	4	0	388	0	71	30	1586	0	236	899	19
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	0	2	2	2
Cap, veh/h	25	9	30	484	0	216	430	1757	0	211	1706	36
Arrive On Green	0.02	0.02	0.00	0.14	0.00	0.14	0.16	0.39	0.00	0.12	0.48	0.48
Sat Flow, veh/h	1344	489	1615	3583	0	1599	1792	3089	0	1774	3544	75
Grp Volume(v), veh/h	15	0	0	388	0	71	30	1586	0	236	449	469
Grp Sat Flow(s), veh/h/ln	1833	0	1615	1792	0	1599	1792	1505	0	1774	1770	1850
Q Serve(g_s), s	1.3	0.0	0.0	16.8	0.0	6.4	2.3	79.4	0.0	19.0	28.2	28.2
Cycle Q Clear(g_c), s	1.3	0.0	0.0	16.8	0.0	6.4	2.3	79.4	0.0	19.0	28.2	28.2
Prop In Lane	0.73			1.00	1.00		1.00	1.00		0.00	1.00	0.04
Lane Grp Cap(c), veh/h	34	0	30	484	0	216	430	1757	0	211	852	890
V/C Ratio(X)	0.44	0.00	0.00	0.80	0.00	0.33	0.07	0.90	0.00	1.12	0.53	0.53
Avail Cap(c_a), veh/h	229	0	202	672	0	300	430	1757	0	211	852	890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.90	0.90	0.90
Uniform Delay (d), s/veh	77.7	0.0	0.0	67.1	0.0	62.6	52.0	44.5	0.0	70.5	28.8	28.8
Incr Delay (d2), s/veh	8.5	0.0	0.0	4.8	0.0	0.9	0.1	8.0	0.0	94.9	2.1	2.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	0.0	8.7	0.0	2.9	1.1	35.0	0.0	14.9	14.2	14.8
LnGrp Delay(d), s/veh	86.1	0.0	0.0	71.9	0.0	63.5	52.1	52.5	0.0	165.4	30.9	30.9
LnGrp LOS	F			E		E	D	D		F	C	C
Approach Vol, veh/h		15			459			1616			1154	
Approach Delay, s/veh		86.1			70.6			52.5			58.4	
Approach LOS		F			E			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.0	101.4		8.0	43.4	82.0		26.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	71.0		20.0	13.0	77.0		30.0				
Max Q Clear Time (g_c+l1), s	21.0	82.4		3.3	4.3	30.2		18.8				
Green Ext Time (p_c), s	0.0	0.0		0.0	7.6	10.1		2.8				
Intersection Summary												
HCM 2010 Ctrl Delay		57.3										
HCM 2010 LOS			E									
Notes												
User approved volume balancing among the lanes for turning movement.												

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	0	27	28	8	60	33	2092	83	66	1106	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		388			644			1512			538	
Travel Time (s)		10.6			17.6			41.2			9.2	
Confl. Peds. (#/hr)			2						2			3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	25.0		11.0	25.0	
Total Split (s)	19.0	19.0	19.0	23.0	23.0	23.0	15.0	102.0		16.0	103.0	
Total Split (%)	11.9%	11.9%	11.9%	14.4%	14.4%	14.4%	9.4%	63.8%		10.0%	64.4%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 131 (82%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



HCM 2010 Signalized Intersection Summary
2: Avondale Rd 1 & NE 95 St

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	0	27	28	8	60	33	2092	83	66	1106	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1881	1584	1900	1845	1845	1900
Adj Flow Rate, veh/h	16	0	27	28	8	61	33	2113	84	67	1117	18
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	3	3	3
Cap, veh/h	51	0	44	71	20	81	330	2155	85	84	2162	35
Arrive On Green	0.03	0.00	0.03	0.05	0.05	0.05	0.37	1.00	1.00	0.05	0.61	0.61
Sat Flow, veh/h	1810	0	1580	1422	406	1615	1792	2952	117	1757	3530	57
Grp Volume(v), veh/h	16	0	27	36	0	61	33	1070	1127	67	554	581
Grp Sat Flow(s), veh/h/ln	1810	0	1580	1829	0	1615	1792	1505	1563	1757	1752	1834
Q Serve(g_s), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	28.7	28.7
Cycle Q Clear(g_c), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	28.7	28.7
Prop In Lane	1.00			1.00	0.78		1.00	1.00		0.07	1.00	0.03
Lane Grp Cap(c), veh/h	51	0	44	92	0	81	330	1099	1142	84	1073	1124
V/C Ratio(X)	0.32	0.00	0.61	0.39	0.00	0.75	0.10	0.97	0.99	0.80	0.52	0.52
Avail Cap(c_a), veh/h	158	0	138	206	0	182	330	1099	1142	121	1073	1124
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.27	0.27	0.27	1.00	1.00	1.00
Uniform Delay(d), s/veh	76.2	0.0	76.9	73.6	0.0	75.0	41.8	0.0	0.0	75.4	17.6	17.6
Incr Delay(d2), s/veh	3.5	0.0	12.7	2.7	0.0	13.1	0.0	9.4	11.2	20.6	1.8	1.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	1.3	1.6	0.0	3.0	1.0	2.9	3.6	3.4	14.4	15.0
LnGrp Delay(d), s/veh	79.7	0.0	89.6	76.3	0.0	88.1	41.9	9.4	11.2	96.0	19.4	19.3
LnGrp LOS	E		F	E		F	D	A	B	F	B	B
Approach Vol, veh/h		43			97			2230			1202	
Approach Delay, s/veh		85.9			83.7			10.8			23.6	
Approach LOS		F			F			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.7	124.8		9.5	34.5	103.0		13.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	97.0		14.0	10.0	98.0		18.0				
Max Q Clear Time (g_c+l1), s	8.0	3.0		4.7	3.9	30.7		8.0				
Green Ext Time (p_c), s	0.0	29.0		0.0	4.8	5.5		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay		18.0										
HCM 2010 LOS			B									
Notes												
User approved pedestrian interval to be less than phase max green.												

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	0	25	26	0	7	39	2212	38	9	1221	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		682			396			2418			1512	
Travel Time (s)		18.6			10.8			65.9			25.8	
Confl. Peds. (#/hr)	5					5			5			5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		26.0	26.0		10.0	25.0		10.0	25.0	
Total Split (s)	27.0	27.0		27.0	27.0		14.0	123.0		10.0	119.0	
Total Split (%)	16.9%	16.9%		16.9%	16.9%		8.8%	76.9%		6.3%	74.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0			0.0			0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	8.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 86 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



HCM 2010 Signalized Intersection Summary
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	0	25	26	0	7	39	2212	38	9	1221	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98			0.97	0.98		0.97	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1881	1584	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	0	26	27	0	7	41	2328	40	10	1285	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	44	8	55	98	5	16	53	2507	43	16	2988	12
Arrive On Green	0.05	0.00	0.05	0.05	0.00	0.05	0.06	1.00	1.00	0.02	1.00	1.00
Sat Flow, veh/h	299	159	1083	1140	91	319	1792	3028	52	1774	3616	14
Grp Volume(v), veh/h	37	0	0	34	0	0	41	1154	1214	10	629	661
Grp Sat Flow(s), veh/h/ln	1542	0	0	1551	0	0	1792	1505	1575	1774	1770	1860
Q Serve(g_s), s	0.6	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.9	0.0	0.0
Cycle Q Clear(g_c), s	3.6	0.0	0.0	3.0	0.0	0.0	3.6	0.0	0.0	0.9	0.0	0.0
Prop In Lane	0.30			0.70	0.79		0.21	1.00		0.03	1.00	0.01
Lane Grp Cap(c), veh/h	107	0	0	119	0	0	53	1246	1304	16	1462	1537
V/C Ratio(X)	0.35	0.00	0.00	0.29	0.00	0.00	0.77	0.93	0.93	0.63	0.43	0.43
Avail Cap(c_a), veh/h	236	0	0	239	0	0	101	1246	1304	55	1462	1537
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.24	0.24	0.24	0.91	0.91	0.91
Uniform Delay (d), s/veh	73.8	0.0	0.0	73.5	0.0	0.0	74.8	0.0	0.0	78.3	0.0	0.0
Incr Delay (d2), s/veh	1.9	0.0	0.0	1.3	0.0	0.0	5.7	3.9	4.0	31.6	0.8	0.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.6	0.0	0.0	1.5	0.0	0.0	1.9	1.3	1.4	0.6	0.3	0.3
LnGrp Delay(d), s/veh	75.7	0.0	0.0	74.9	0.0	0.0	80.5	3.9	4.0	109.9	0.8	0.8
LnGrp LOS	E			E			F	A	A	F	A	A
Approach Vol, veh/h		37			34			2409			1300	
Approach Delay, s/veh		75.7			74.9			5.2			1.7	
Approach LOS		E			E			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	140.5		13.1	9.7	137.2		13.1				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	118.0		22.0	9.0	114.0		22.0				
Max Q Clear Time (g_c+l1), s	2.9	3.0		5.6	5.6	2.0		5.0				
Green Ext Time (p_c), s	0.0	114.3		0.3	0.0	111.3		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			5.3									
HCM 2010 LOS			A									

Lanes, Volumes, Timings
4: Avondale Rd 1 & Avondale Way

5/10/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑ ↗	↗		↑↑	↑↑	↗
Volume (vph)	694	47	0	1795	950	422
Ideal Flow (vphpl)	1900	1900	1900	1600	1900	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes			Yes	
Link Speed (mph)	30			25	40	
Link Distance (ft)	533			872	2418	
Travel Time (s)	12.1			23.8	41.2	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Shared Lane Traffic (%)						
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.24	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	58.0	58.0		102.0	102.0	
Total Split (%)	36.3%	36.3%		63.8%	63.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		3.0	0.0	
Total Lost Time (s)	5.0	5.0		8.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type:	Other
Cycle Length:	160
Actuated Cycle Length:	160
Offset:	1 (1%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary
4: Avondale Rd 1 & Avondale Way

5/10/2016

Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	694	47	0	1795	950	422		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1881	0	1584	1863	1863		
Adj Flow Rate, veh/h	746	51	0	1930	1022	0		
Adj No. of Lanes	2	1	0	2	2	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	1	0	1	2	2		
Cap, veh/h	898	413	0	1987	2403	1075		
Arrive On Green	0.26	0.26	0.00	0.88	0.22	0.00		
Sat Flow, veh/h	3476	1599	0	3168	3632	1583		
Grp Volume(v), veh/h	746	51	0	1930	1022	0		
Grp Sat Flow(s), veh/h/ln	1738	1599	0	1505	1770	1583		
Q Serve(g_s), s	32.4	3.9	0.0	84.9	39.6	0.0		
Cycle Q Clear(g_c), s	32.4	3.9	0.0	84.9	39.6	0.0		
Prop In Lane	1.00	1.00	0.00			1.00		
Lane Grp Cap(c), veh/h	898	413	0	1987	2403	1075		
V/C Ratio(X)	0.83	0.12	0.00	0.97	0.43	0.00		
Avail Cap(c_a), veh/h	1151	530	0	1987	2403	1075		
HCM Platoon Ratio	1.00	1.00	1.00	1.33	0.33	0.33		
Upstream Filter(l)	1.00	1.00	0.00	0.33	0.90	0.00		
Uniform Delay (d), s/veh	56.0	45.4	0.0	8.5	35.3	0.0		
Incr Delay (d2), s/veh	4.2	0.1	0.0	6.6	0.5	0.0		
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%), veh/ln	16.1	1.7	0.0	35.1	19.6	0.0		
LnGrp Delay(d), s/veh	60.2	45.6	0.0	15.1	35.8	0.0		
LnGrp LOS	E	D		B	D			
Approach Vol, veh/h	797			1930	1022			
Approach Delay, s/veh	59.2			15.1	35.8			
Approach LOS	E			B	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s	113.6			46.4		113.6		
Change Period (Y+Rc), s	5.0			5.0		5.0		
Max Green Setting (Gmax), s	97.0			53.0		97.0		
Max Q Clear Time (g_c+l1), s	87.9			34.4		41.6		
Green Ext Time (p_c), s	8.9			6.9		50.8		
Intersection Summary								
HCM 2010 Ctrl Delay			30.1					
HCM 2010 LOS			C					

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↓		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↓	
Volume (vph)	4	587	29	447	446	460	98	1311	1042	249	620	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	200		0	0		260	150		0	400		120
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			35			25			40	
Link Distance (ft)		465			621			484			872	
Travel Time (s)		10.6			12.1			13.2			14.9	
Confl. Peds. (#/hr)			8			4			4			
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8			2			
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	20.0	34.0		25.0	30.0	18.0	12.0	40.0	25.0	18.0	40.0	
Total Split (s)	18.0	33.0		25.0	40.0	22.0	40.0	80.0	25.0	22.0	62.0	
Total Split (%)	11.3%	20.6%		15.6%	25.0%	13.8%	25.0%	50.0%	15.6%	13.8%	38.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	8.5	5.0	5.0	5.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	
Lead-Lag Optimize?					Yes	Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

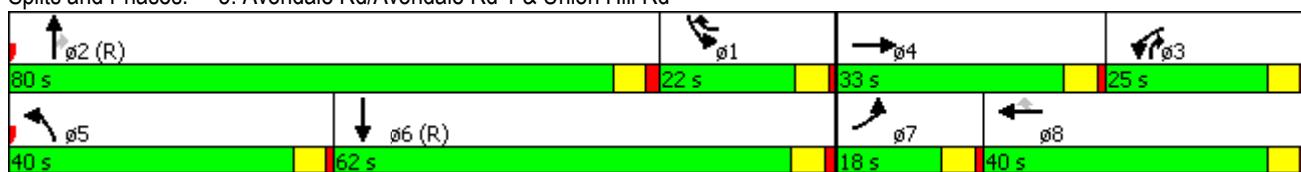
Actuated Cycle Length: 160

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



Bear Creek Rezone

2019 With A155 senior housing PM Peak 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		
Volume (veh/h)	4	587	29	447	446	460	98	1311	1042	249	620	18	
Number	7	4	14	3	8	18	5	2	12	1	6	16	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00			0.99	1.00		1.00		1.00	1.00		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1569	1863	1827	1827	1900	
Adj Flow Rate, veh/h	4	593	29	452	451	363	99	1324	1018	252	626	18	
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	4	4	4	
Cap, veh/h	11	601	29	430	547	795	123	1332	933	364	3033	87	
Arrive On Green	0.01	0.17	0.17	0.13	0.29	0.29	0.07	0.45	0.47	0.07	0.20	0.20	
Sat Flow, veh/h	1774	3432	168	3442	1863	1577	1774	2980	1579	1740	4984	143	
Grp Volume(v), veh/h	4	305	317	452	451	363	99	1324	1018	252	417	227	
Grp Sat Flow(s),veh/h/ln	1774	1770	1830	1721	1863	1577	1774	1490	1579	1740	1663	1802	
Q Serve(g_s), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	70.7	74.5	22.7	16.7	16.8	
Cycle Q Clear(g_c), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	70.7	74.5	22.7	16.7	16.8	
Prop In Lane	1.00			0.09	1.00		1.00	1.00		1.00	1.00	0.08	
Lane Grp Cap(c), veh/h	11	310	320	430	547	795	123	1332	933	364	2023	1096	
V/C Ratio(X)	0.37	0.99	0.99	1.05	0.82	0.46	0.80	0.99	1.09	0.69	0.21	0.21	
Avail Cap(c_a), veh/h	144	310	320	430	547	795	388	1332	933	364	2023	1096	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	
Upstream Filter(l)	1.00	1.00	1.00	0.81	0.81	0.81	1.00	1.00	1.00	0.91	0.91	0.91	
Uniform Delay (d), s/veh	79.2	65.8	65.8	70.0	52.6	26.1	73.4	44.0	32.7	69.4	31.7	31.7	
Incr Delay (d2), s/veh	19.6	47.2	47.0	53.0	8.2	0.3	4.5	23.3	57.4	5.3	0.2	0.4	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.2	17.5	18.2	12.7	19.8	10.4	4.5	33.4	47.2	11.5	7.8	8.5	
LnGrp Delay(d),s/veh	98.8	113.0	112.8	123.0	60.8	26.4	77.9	67.3	90.1	74.7	31.9	32.1	
LnGrp LOS	F	F	F	F	E	C	E	E	F	E	C	C	
Approach Vol, veh/h		626			1266			2441			896		
Approach Delay, s/veh		112.8			73.1			77.3			44.0		
Approach LOS		F			E			E			D		
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc), s	39.5	80.0	25.0	33.0	16.1	103.4	6.0	52.0					
Change Period (Y+Rc), s	5.5	* 5.5	5.0	5.0	5.0	5.5	5.0	5.0					
Max Green Setting (Gmax), s	17.0	* 75	20.0	28.0	35.0	56.5	13.0	35.0					
Max Q Clear Time (g_c+l1), s	24.7	76.5	22.0	29.6	10.8	19.7	2.4	38.1					
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.5	8.5	0.0	0.0					
Intersection Summary													
HCM 2010 Ctrl Delay			74.8										
HCM 2010 LOS			E										
Notes													
User approved pedestrian interval to be less than phase max green.													
User approved ignoring U-Turning movement.													
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.													

2019 With Project (248 Apartments)

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	5	33	746	1	265	4	404	0	186	1245	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0	0	0	0	0	150	0	0	150	0	0	0
Storage Lanes	0		1	1		1	1		0	1	0	0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		219			262			340			1991	
Travel Time (s)		6.0			7.1			6.6			54.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	8%	8%	8%	3%	3%	3%
Shared Lane Traffic (%)				50%								
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	12				12			12			12	
Link Offset(ft)	0				0			0			0	
Crosswalk Width(ft)	16				16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	12.0	63.0		27.0	78.0	
Total Split (%)	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	8.6%	45.0%		19.3%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 27 (19%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	19	5	33	746	1	265	4	404	0	186	1245	10
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1792	1863	1863	1863	1759	1759	0	1845	1553	1900
Adj Flow Rate, veh/h	20	5	31	795	0	71	4	430	0	198	1324	11
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	6	6	6	2	2	2	8	8	0	3	3	3
Cap, veh/h	43	11	48	507	0	226	7	1854	0	226	1972	16
Arrive On Green	0.03	0.03	0.03	0.14	0.00	0.14	0.00	0.18	0.00	0.13	0.66	0.68
Sat Flow, veh/h	1379	345	1524	3548	0	1583	1675	3431	0	1757	3000	25
Grp Volume(v), veh/h	25	0	31	795	0	71	4	430	0	198	651	684
Grp Sat Flow(s), veh/h/ln	1724	0	1524	1774	0	1583	1675	1671	0	1757	1476	1549
Q Serve(g_s), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	15.4	0.0	15.5	37.9	37.9
Cycle Q Clear(g_c), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	15.4	0.0	15.5	37.9	37.9
Prop In Lane	0.80			1.00		1.00	1.00			0.00	1.00	0.02
Lane Grp Cap(c), veh/h	54	0	48	507	0	226	7	1854	0	226	970	1018
V/C Ratio(X)	0.46	0.00	0.65	1.57	0.00	0.31	0.58	0.23	0.00	0.88	0.67	0.67
Avail Cap(c_a), veh/h	246	0	218	507	0	226	84	1854	0	276	970	1018
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.79	0.79	0.79
Uniform Delay(d), s/veh	66.7	0.0	67.1	60.0	0.0	53.8	69.8	31.8	0.0	59.9	14.7	14.7
Incr Delay(d2), s/veh	6.1	0.0	14.0	265.3	0.0	0.8	59.3	0.3	0.0	18.7	2.9	2.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.0	0.0	1.4	28.5	0.0	2.5	0.3	7.2	0.0	8.7	16.2	16.9
LnGrp Delay(d), s/veh	72.7	0.0	81.0	325.3	0.0	54.6	129.1	32.0	0.0	78.7	17.6	17.5
LnGrp LOS	E		F		D	F	C		E	B	B	
Approach Vol, veh/h		56			866			434			1533	
Approach Delay, s/veh		77.3			303.1			32.9			25.5	
Approach LOS		E			F		C			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	82.6		25.0	5.6	100.0		9.4				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	22.0	58.0		20.0	7.0	73.0		20.0				
Max Q Clear Time (g_c+l1), s	17.5	17.4		22.0	2.3	40.9		4.8				
Green Ext Time (p_c), s	0.5	26.9		0.0	0.0	22.8		0.1				
Intersection Summary												
HCM 2010 Ctrl Delay		110.8										
HCM 2010 LOS			F									
Notes												
User approved volume balancing among the lanes for turning movement.												

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	6	57	56	4	30	4	669	8	9	2003	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		384			667			1512			582	
Travel Time (s)		10.5			18.2			29.5			15.9	
Confl. Peds. (#/hr)												2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	8%	8%	8%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4		4				
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	78.0		11.0	78.0	
Total Split (%)	18.6%	18.6%	18.6%	17.9%	17.9%	17.9%	7.9%	55.7%		7.9%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 137 (98%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



HCM 2010 Signalized Intersection Summary
2: Avondale Rd 1 & NE 95 St

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	29	6	57	56	4	30	4	669	8	9	2003	7
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1845	1900	1845	1845	1759	1759	1900	1863	1569	1900
Adj Flow Rate, veh/h	32	7	63	62	4	33	4	743	9	10	2226	8
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	8	8	8	2	2	2
Cap, veh/h	79	17	85	85	6	81	7	2509	30	16	2210	8
Arrive On Green	0.05	0.05	0.05	0.05	0.05	0.05	0.01	1.00	1.00	0.01	0.73	0.75
Sat Flow, veh/h	1454	318	1568	1655	107	1568	1675	3382	41	1774	3046	11
Grp Volume(v), veh/h	39	0	63	66	0	33	4	367	385	10	1088	1146
Grp Sat Flow(s),veh/h/ln	1772	0	1568	1762	0	1568	1675	1671	1752	1774	1490	1567
Q Serve(g_s), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Cycle Q Clear(g_c), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Prop In Lane	0.82			1.00	0.94		1.00	1.00		0.02	1.00	0.01
Lane Grp Cap(c), veh/h	96	0	85	91	0	81	7	1240	1300	16	1081	1137
V/C Ratio(X)	0.40	0.00	0.74	0.73	0.00	0.41	0.58	0.30	0.30	0.61	1.01	1.01
Avail Cap(c_a), veh/h	266	0	235	252	0	224	72	1240	1300	76	1081	1137
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.0	0.0	65.2	65.4	0.0	64.3	69.3	0.0	0.0	69.1	19.2	19.2
Incr Delay (d2), s/veh	2.7	0.0	11.7	10.4	0.0	3.3	58.0	0.6	0.6	31.8	29.0	28.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	2.7	2.8	0.0	1.3	0.3	0.2	0.2	0.5	49.9	52.3
LnGrp Delay(d),s/veh	66.7	0.0	76.9	75.8	0.0	67.6	127.3	0.6	0.6	100.9	48.2	47.8
LnGrp LOS	E		E			E	F	A	A	F	F	F
Approach Vol, veh/h		102				99			756		2244	
Approach Delay, s/veh		73.0				73.1			1.2		48.2	
Approach LOS		E				E			A		D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	108.9		12.2	5.6	109.6		12.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	6.0	73.0		20.0	6.0	73.0		21.0				
Max Q Clear Time (g_c+l1), s	2.8	2.0		7.2	2.3	104.6		7.5				
Green Ext Time (p_c), s	0.0	39.7		0.2	0.0	0.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			38.7									
HCM 2010 LOS			D									

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	0	50	100	0	25	10	669	26	7	2166	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		686			583			2421			1512	
Travel Time (s)		18.7			15.9			47.2			41.2	
Confl. Peds. (#/hr)	5					5			5			7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		5.0	4.0	
Minimum Split (s)	25.0	25.0		26.0	26.0		10.0	25.0		10.0	28.0	
Total Split (s)	26.0	26.0		26.0	26.0		10.0	104.0		10.0	104.0	
Total Split (%)	18.6%	18.6%		18.6%	18.6%		7.1%	74.3%		7.1%	74.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0			0.0			0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 12 (9%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



Bear Creek Rezone

2019 248 Apartments AM Peak - 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	0	50	100	0	25	10	669	26	7	2166	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1810	1810	1900	1863	1569	1900
Adj Flow Rate, veh/h	9	0	54	109	0	27	11	727	28	8	2354	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	2	2	2
Cap, veh/h	43	14	168	178	0	33	17	2581	99	17	2267	5
Arrive On Green	0.12	0.00	0.12	0.12	0.00	0.12	0.01	1.00	1.00	0.02	1.00	1.00
Sat Flow, veh/h	117	119	1417	1114	0	276	1723	3375	130	1774	3051	6
Grp Volume(v), veh/h	63	0	0	136	0	0	11	370	385	8	1149	1210
Grp Sat Flow(s), veh/h/ln	1653	0	0	1390	0	0	1723	1719	1786	1774	1490	1567
Q Serve(g_s), s	0.0	0.0	0.0	8.3	0.0	0.0	0.9	0.0	0.0	0.6	0.0	97.9
Cycle Q Clear(g_c), s	5.1	0.0	0.0	13.3	0.0	0.0	0.9	0.0	0.0	0.6	0.0	97.9
Prop In Lane	0.14		0.86	0.80		0.20	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	225	0	0	211	0	0	17	1315	1366	17	1107	1165
V/C Ratio(X)	0.28	0.00	0.00	0.64	0.00	0.00	0.64	0.28	0.28	0.47	1.04	1.04
Avail Cap(c_a), veh/h	274	0	0	254	0	0	62	1315	1366	63	1107	1165
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.98	0.98	0.98	0.16	0.16	0.16
Uniform Delay(d), s/veh	56.6	0.0	0.0	60.2	0.0	0.0	68.8	0.0	0.0	68.3	0.0	0.0
Incr Delay(d2), s/veh	0.7	0.0	0.0	4.1	0.0	0.0	33.0	0.5	0.5	3.3	22.6	22.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	2.3	0.0	0.0	5.4	0.0	0.0	0.6	0.2	0.2	0.3	7.0	7.3
LnGrp Delay(d), s/veh	57.3	0.0	0.0	64.3	0.0	0.0	101.8	0.5	0.5	71.6	22.6	22.7
LnGrp LOS	E		E			F	A	A	E	F	F	
Approach Vol, veh/h		63			136			766			2367	
Approach Delay, s/veh		57.3			64.3			2.0			22.8	
Approach LOS		E			E			A			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	112.1		21.6	6.4	112.0		21.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	99.0		21.0	5.0	99.0		21.0				
Max Q Clear Time (g_c+l1), s	2.6	2.0		7.1	2.9	99.9		15.3				
Green Ext Time (p_c), s	0.0	96.4		1.0	0.0	0.0		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			20.4									
HCM 2010 LOS			C									

Lanes, Volumes, Timings
4: Avondale Rd 1 & Avondale Way

5/10/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑↑	↑↑↑	↑↑
Volume (vph)	99	1	0	612	2056	418
Ideal Flow (vphpl)	1900	1900	1900	1900	1600	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red			Yes			Yes
Link Speed (mph)	30			35	25	
Link Distance (ft)	1136			883	2421	
Travel Time (s)	25.8			17.2	66.0	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	8%	8%	2%	2%
Shared Lane Traffic (%)						
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	15.0	15.0		125.0	125.0	
Total Split (%)	10.7%	10.7%		89.3%	89.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0		5.0	8.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type:	Other
Cycle Length:	140
Actuated Cycle Length:	140
Offset:	76 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green
Natural Cycle:	75
Control Type:	Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary
4: Avondale Rd 1 & Avondale Way

5/10/2016

Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	↑↑	↑		↑↑	↑↑	↑		
Volume (veh/h)	99	1	0	612	2056	418		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	0	1759	1569	1863		
Adj Flow Rate, veh/h	102	1	0	631	2120	0		
Adj No. of Lanes	2	1	0	2	2	1		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	0	8	2	2		
Cap, veh/h	152	70	0	2957	2572	1400		
Arrive On Green	0.04	0.04	0.00	1.00	1.00	0.00		
Sat Flow, veh/h	3442	1583	0	3519	3059	1583		
Grp Volume(v), veh/h	102	1	0	631	2120	0		
Grp Sat Flow(s), veh/h/ln	1721	1583	0	1671	1490	1583		
Q Serve(g_s), s	4.1	0.1	0.0	0.0	0.0	0.0		
Cycle Q Clear(g_c), s	4.1	0.1	0.0	0.0	0.0	0.0		
Prop In Lane	1.00	1.00	0.00			1.00		
Lane Grp Cap(c), veh/h	152	70	0	2957	2572	1400		
V/C Ratio(X)	0.67	0.01	0.00	0.21	0.82	0.00		
Avail Cap(c_a), veh/h	246	113	0	2957	2572	1400		
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00		
Upstream Filter(I)	0.99	0.99	0.00	0.92	0.09	0.00		
Uniform Delay (d), s/veh	65.9	64.0	0.0	0.0	0.0	0.0		
Incr Delay (d2), s/veh	5.0	0.1	0.0	0.2	0.3	0.0		
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%), veh/ln	2.0	0.0	0.0	0.1	0.1	0.0		
LnGrp Delay(d), s/veh	70.9	64.1	0.0	0.2	0.3	0.0		
LnGrp LOS	E	E		A	A			
Approach Vol, veh/h	103			631	2120			
Approach Delay, s/veh	70.9			0.2	0.3			
Approach LOS	E			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		128.8		11.2		128.8		
Change Period (Y+Rc), s		5.0		5.0		5.0		
Max Green Setting (Gmax), s		120.0		10.0		120.0		
Max Q Clear Time (g_c+l1), s		2.0		6.1		3.0		
Green Ext Time (p_c), s		97.3		0.2		96.6		
Intersection Summary								
HCM 2010 Ctrl Delay			2.8					
HCM 2010 LOS			A					

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	354	84	750	280	148	75	408	568	224	1624	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	200		0	0		260	150		0	400		120
Storage Lanes	1		0	2		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			35			35			25	
Link Distance (ft)		455			647			504			883	
Travel Time (s)		10.3			12.6			9.8			24.1	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	24			24				12			12	
Link Offset(ft)	0			0				0			0	
Crosswalk Width(ft)	16			16			16			16		
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases					8			2				
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	25.0	34.0		25.0	30.0	13.0	11.0	32.5	25.0	13.0	30.5	
Total Split (s)	25.0	34.0		39.0	48.0	31.0	11.0	36.0	39.0	31.0	56.0	
Total Split (%)	17.9%	24.3%		27.9%	34.3%	22.1%	7.9%	25.7%	27.9%	22.1%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.5	5.0	5.0	8.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

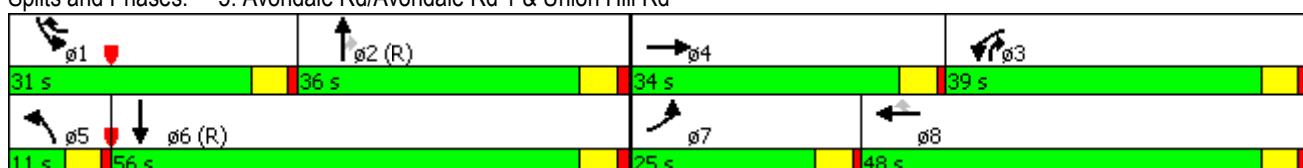
Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 135

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑ ↗	↑ ↘		↖ ↗	↑ ↗	↖ ↗	↖ ↗	↑ ↗	↖ ↗	↖ ↗	↑ ↗	
Volume (veh/h)	6	354	84	750	280	148	75	408	568	224	1624	8
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1776	1776	1776	1810	1810	1810	1863	1569	1900
Adj Flow Rate, veh/h	6	369	88	781	292	94	78	425	516	233	1692	8
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	7	7	7	5	5	5	2	2	2
Cap, veh/h	16	449	106	797	696	818	74	1040	839	267	1709	8
Arrive On Green	0.01	0.16	0.16	0.41	0.65	0.65	0.04	0.30	0.30	0.05	0.13	0.14
Sat Flow, veh/h	1774	2843	671	3281	1776	1509	1723	3438	1538	1774	4399	21
Grp Volume(v), veh/h	6	228	229	781	292	94	78	425	516	233	1098	602
Grp Sat Flow(s), veh/h/ln	1774	1770	1744	1640	1776	1509	1723	1719	1538	1774	1427	1565
Q Serve(g_s), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.8	13.2	18.3	53.8	53.8
Cycle Q Clear(g_c), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.8	13.2	18.3	53.8	53.8
Prop In Lane	1.00		0.38	1.00		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	16	279	276	797	696	818	74	1040	839	267	1109	608
V/C Ratio(X)	0.38	0.82	0.83	0.98	0.42	0.11	1.06	0.41	0.62	0.87	0.99	0.99
Avail Cap(c_a), veh/h	253	367	361	797	696	818	74	1040	839	329	1109	608
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(l)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	1.00	1.00	0.42	0.42	0.42
Uniform Delay(d), s/veh	69.0	57.0	57.1	41.3	16.6	8.7	67.0	38.9	7.6	65.2	60.8	60.8
Incr Delay(d2), s/veh	14.3	10.4	11.8	24.0	0.3	0.1	121.0	1.2	3.4	9.2	15.4	21.5
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.3	9.4	9.5	17.5	5.3	1.0	5.3	6.7	6.4	9.7	23.7	27.0
LnGrp Delay(d), s/veh	83.3	67.3	69.0	65.2	16.9	8.7	189.3	40.1	11.0	74.4	76.1	82.3
LnGrp LOS	F	E	E	E	B	A	F	D	B	E	E	F
Approach Vol, veh/h		463			1167			1019			1933	
Approach Delay, s/veh		68.3			48.6			36.8			77.8	
Approach LOS		E			D			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	26.1	47.8	39.0	27.1	11.0	62.9	6.2	59.9				
Change Period (Y+Rc), s	5.0	5.5	5.0	5.0	5.0	5.5	5.0	5.0				
Max Green Setting (Gmax), s	26.0	30.5	34.0	29.0	6.0	50.5	20.0	43.0				
Max Q Clear Time (g_c+l1), s	20.3	15.8	34.9	19.8	8.0	56.8	2.5	13.0				
Green Ext Time (p_c), s	0.8	13.7	0.0	2.3	0.0	0.0	0.0	11.9				
Intersection Summary												
HCM 2010 Ctrl Delay		60.3										
HCM 2010 LOS			E									
Notes												
User approved ignoring U-Turning movement.												

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	4	22	383	2	306	29	1559	0	231	893	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0	0	0	0	0	150	0	0	150	0	0	0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		174			206			383			2033	
Travel Time (s)		4.7			5.6			10.4			34.7	
Confl. Peds. (#/hr)			3									
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)			50%									
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	35.0	35.0	35.0	18.0	76.0		24.0	82.0	
Total Split (%)	15.6%	15.6%	15.6%	21.9%	21.9%	21.9%	11.3%	47.5%		15.0%	51.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max							

Intersection Summary

Area Type: Other

Cycle Length: 160

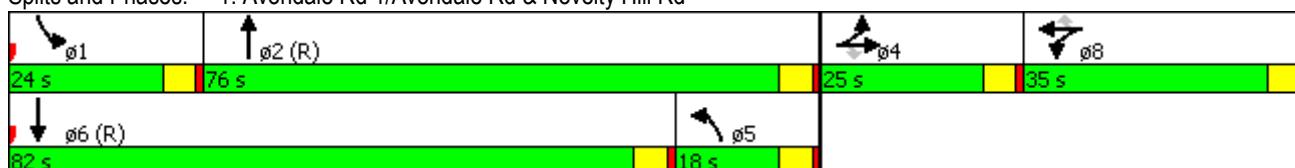
Actuated Cycle Length: 160

Offset: 14 (9%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	4	22	383	2	306	29	1559	0	231	893	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00		1.00	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1881	1584	0	1863	1863	1900
Adj Flow Rate, veh/h	11	4	0	392	0	71	30	1591	0	236	911	19
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	0	2	2	2
Cap, veh/h	25	9	30	488	0	218	428	1753	0	211	1706	36
Arrive On Green	0.02	0.02	0.00	0.14	0.00	0.14	0.16	0.39	0.00	0.12	0.48	0.48
Sat Flow, veh/h	1344	489	1615	3583	0	1599	1792	3089	0	1774	3545	74
Grp Volume(v), veh/h	15	0	0	392	0	71	30	1591	0	236	455	475
Grp Sat Flow(s), veh/h/ln	1833	0	1615	1792	0	1599	1792	1505	0	1774	1770	1850
Q Serve(g_s), s	1.3	0.0	0.0	17.0	0.0	6.4	2.3	79.8	0.0	19.0	28.7	28.7
Cycle Q Clear(g_c), s	1.3	0.0	0.0	17.0	0.0	6.4	2.3	79.8	0.0	19.0	28.7	28.7
Prop In Lane	0.73			1.00	1.00		1.00	1.00		0.00	1.00	0.04
Lane Grp Cap(c), veh/h	34	0	30	488	0	218	428	1753	0	211	852	890
V/C Ratio(X)	0.44	0.00	0.00	0.80	0.00	0.33	0.07	0.91	0.00	1.12	0.53	0.53
Avail Cap(c_a), veh/h	229	0	202	672	0	300	428	1753	0	211	852	890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.90	0.90	0.90
Uniform Delay (d), s/veh	77.7	0.0	0.0	67.0	0.0	62.5	52.1	44.7	0.0	70.5	29.0	29.0
Incr Delay (d2), s/veh	8.5	0.0	0.0	4.9	0.0	0.9	0.1	8.4	0.0	94.9	2.2	2.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	0.0	8.8	0.0	2.9	1.1	35.3	0.0	14.9	14.5	15.2
LnGrp Delay(d), s/veh	86.1	0.0	0.0	72.0	0.0	63.3	52.2	53.1	0.0	165.4	31.1	31.0
LnGrp LOS	F			E		E	D	D		F	C	C
Approach Vol, veh/h		15			463			1621			1166	
Approach Delay, s/veh		86.1			70.6			53.1			58.3	
Approach LOS		F			E			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.0	101.2		8.0	43.2	82.0		26.8				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	71.0		20.0	13.0	77.0		30.0				
Max Q Clear Time (g_c+l1), s	21.0	82.8		3.3	4.3	30.7		19.0				
Green Ext Time (p_c), s	0.0	0.0		0.0	7.6	10.3		2.8				
Intersection Summary												
HCM 2010 Ctrl Delay		57.6										
HCM 2010 LOS			E									
Notes												
User approved volume balancing among the lanes for turning movement.												

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	0	27	28	8	60	33	2099	83	66	1122	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		388			644			1512			538	
Travel Time (s)		10.6			17.6			41.2			9.2	
Confl. Peds. (#/hr)			2						2			3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	25.0		11.0	25.0	
Total Split (s)	19.0	19.0	19.0	23.0	23.0	23.0	15.0	102.0		16.0	103.0	
Total Split (%)	11.9%	11.9%	11.9%	14.4%	14.4%	14.4%	9.4%	63.8%		10.0%	64.4%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 131 (82%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



HCM 2010 Signalized Intersection Summary
2: Avondale Rd 1 & NE 95 St

5/10/2016

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	0	27	28	8	60	33	2099	83	66	1122	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1881	1584	1900	1845	1845	1900
Adj Flow Rate, veh/h	16	0	27	28	8	61	33	2120	84	67	1133	18
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	3	3	3
Cap, veh/h	51	0	44	71	20	81	330	2156	85	84	2163	34
Arrive On Green	0.03	0.00	0.03	0.05	0.05	0.05	0.37	1.00	1.00	0.05	0.61	0.61
Sat Flow, veh/h	1810	0	1580	1422	406	1615	1792	2952	116	1757	3531	56
Grp Volume(v), veh/h	16	0	27	36	0	61	33	1074	1130	67	562	589
Grp Sat Flow(s), veh/h/ln	1810	0	1580	1829	0	1615	1792	1505	1563	1757	1752	1835
Q Serve(g_s), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	29.3	29.3
Cycle Q Clear(g_c), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	29.3	29.3
Prop In Lane	1.00			1.00	0.78		1.00	1.00		0.07	1.00	0.03
Lane Grp Cap(c), veh/h	51	0	44	92	0	81	330	1099	1142	84	1073	1124
V/C Ratio(X)	0.32	0.00	0.61	0.39	0.00	0.75	0.10	0.98	0.99	0.80	0.52	0.52
Avail Cap(c_a), veh/h	158	0	138	206	0	182	330	1099	1142	121	1073	1124
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.09	0.09	0.09	1.00	1.00	1.00
Uniform Delay (d), s/veh	76.2	0.0	76.9	73.6	0.0	75.0	41.8	0.0	0.0	75.4	17.7	17.7
Incr Delay (d2), s/veh	3.5	0.0	12.7	2.7	0.0	13.1	0.0	4.4	6.0	20.6	1.8	1.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	1.3	1.6	0.0	3.0	1.0	1.3	1.9	3.4	14.6	15.3
LnGrp Delay(d), s/veh	79.7	0.0	89.6	76.3	0.0	88.1	41.8	4.4	6.0	96.0	19.5	19.4
LnGrp LOS	E		F	E		F	D	A	A	F	B	B
Approach Vol, veh/h		43			97			2237			1218	
Approach Delay, s/veh		85.9			83.7			5.8			23.7	
Approach LOS		F			F			A			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.7	124.8		9.5	34.5	103.0		13.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	97.0		14.0	10.0	98.0		18.0				
Max Q Clear Time (g_c+l1), s	8.0	3.0		4.7	3.9	31.3		8.0				
Green Ext Time (p_c), s	0.0	29.3		0.0	4.8	5.6		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay		14.9										
HCM 2010 LOS			B									
Notes												
User approved pedestrian interval to be less than phase max green.												

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	0	25	55	0	14	39	2212	101	25	1221	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		682			396			2418			1512	
Travel Time (s)		18.6			10.8			65.9			25.8	
Confl. Peds. (#/hr)	5					5			5			5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		26.0	26.0		10.0	25.0		10.0	25.0	
Total Split (s)	27.0	27.0		27.0	27.0		14.0	123.0		10.0	119.0	
Total Split (%)	16.9%	16.9%		16.9%	16.9%		8.8%	76.9%		6.3%	74.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0			0.0			0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	8.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 86 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



Bear Creek Rezone

2019 With Apartments PM Peak 1%

Synchro 8 Report

HCM 2010 Signalized Intersection Summary
3: Avondale Rd 1 & 180th Ave NE

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	0	25	55	0	14	39	2212	101	25	1221	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99			0.98	0.98		1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1881	1584	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	0	26	58	0	15	41	2328	106	27	1285	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	52	13	84	124	4	23	53	2332	105	34	2906	11
Arrive On Green	0.07	0.00	0.07	0.07	0.00	0.07	0.06	1.00	1.00	0.04	1.00	1.00
Sat Flow, veh/h	314	171	1146	1139	55	309	1792	2933	133	1774	3616	14
Grp Volume(v), veh/h	37	0	0	73	0	0	41	1186	1248	27	629	661
Grp Sat Flow(s), veh/h/ln	1631	0	0	1503	0	0	1792	1505	1560	1774	1770	1860
Q Serve(g_s), s	0.0	0.0	0.0	3.8	0.0	0.0	3.6	0.0	127.2	2.4	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	0.0	7.2	0.0	0.0	3.6	0.0	127.2	2.4	0.0	0.0
Prop In Lane	0.30			0.70	0.79		0.21	1.00		0.08	1.00	0.01
Lane Grp Cap(c), veh/h	148	0	0	150	0	0	53	1197	1241	34	1422	1495
V/C Ratio(X)	0.25	0.00	0.00	0.49	0.00	0.00	0.77	0.99	1.01	0.79	0.44	0.44
Avail Cap(c_a), veh/h	245	0	0	240	0	0	101	1197	1241	55	1422	1495
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.18	0.18	0.18	0.91	0.91	0.91
Uniform Delay(d), s/veh	70.3	0.0	0.0	71.9	0.0	0.0	74.8	0.0	0.0	76.6	0.0	0.0
Incr Delay(d2), s/veh	0.9	0.0	0.0	2.4	0.0	0.0	4.4	9.2	12.4	29.5	0.9	0.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.6	0.0	0.0	3.2	0.0	0.0	1.8	3.1	4.3	1.5	0.4	0.4
LnGrp Delay(d), s/veh	71.2	0.0	0.0	74.3	0.0	0.0	79.2	9.2	12.4	106.0	0.9	0.9
LnGrp LOS	E			E			E	A	F	F	A	A
Approach Vol, veh/h		37			73			2475			1317	
Approach Delay, s/veh		71.2			74.3			11.9			3.0	
Approach LOS		E			E			B			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	135.2		16.7	9.7	133.6		16.7				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	118.0		22.0	9.0	114.0		22.0				
Max Q Clear Time (g_c+l1), s	4.4	129.2		5.4	5.6	2.0		9.2				
Green Ext Time (p_c), s	0.0	0.0		0.5	0.0	111.3		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			10.7									
HCM 2010 LOS			B									

Lanes, Volumes, Timings
4: Avondale Rd 1 & Avondale Way

5/10/2016



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑↑	↑↑		↑↑↑	↑↑↑	↑↑
Volume (vph)	710	47	0	1842	971	430
Ideal Flow (vphpl)	1900	1900	1900	1600	1900	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red			Yes			Yes
Link Speed (mph)	30			25	40	
Link Distance (ft)	533			872	2418	
Travel Time (s)	12.1			23.8	41.2	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Shared Lane Traffic (%)						
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.24	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	58.0	58.0		102.0	102.0	
Total Split (%)	36.3%	36.3%		63.8%	63.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		3.0	0.0	
Total Lost Time (s)	5.0	5.0		8.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type:	Other
Cycle Length:	160
Actuated Cycle Length:	160
Offset:	1 (1%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary
4: Avondale Rd 1 & Avondale Way

5/10/2016

Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Volume (veh/h)	710	47	0	1842	971	430		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1881	1881	0	1584	1863	1863		
Adj Flow Rate, veh/h	763	51	0	1981	1044	0		
Adj No. of Lanes	2	1	0	2	2	1		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Percent Heavy Veh, %	1	1	0	1	2	2		
Cap, veh/h	915	421	0	1973	2387	1068		
Arrive On Green	0.26	0.26	0.00	0.87	0.22	0.00		
Sat Flow, veh/h	3476	1599	0	3168	3632	1583		
Grp Volume(v), veh/h	763	51	0	1981	1044	0		
Grp Sat Flow(s), veh/h/ln	1738	1599	0	1505	1770	1583		
Q Serve(g_s), s	33.2	3.9	0.0	104.9	40.7	0.0		
Cycle Q Clear(g_c), s	33.2	3.9	0.0	104.9	40.7	0.0		
Prop In Lane	1.00	1.00	0.00			1.00		
Lane Grp Cap(c), veh/h	915	421	0	1973	2387	1068		
V/C Ratio(X)	0.83	0.12	0.00	1.00	0.44	0.00		
Avail Cap(c_a), veh/h	1151	530	0	1973	2387	1068		
HCM Platoon Ratio	1.00	1.00	1.00	1.33	0.33	0.33		
Upstream Filter(l)	1.00	1.00	0.00	0.27	0.89	0.00		
Uniform Delay (d), s/veh	55.6	44.9	0.0	10.2	36.1	0.0		
Incr Delay (d2), s/veh	4.4	0.1	0.0	11.6	0.5	0.0		
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%), veh/ln	16.5	1.7	0.0	44.4	20.1	0.0		
LnGrp Delay(d), s/veh	60.0	45.0	0.0	21.8	36.6	0.0		
LnGrp LOS	E	D		F	D			
Approach Vol, veh/h	814			1981	1044			
Approach Delay, s/veh	59.1			21.8	36.6			
Approach LOS	E			C	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s	112.9			47.1		112.9		
Change Period (Y+Rc), s	5.0			5.0		5.0		
Max Green Setting (Gmax), s	97.0			53.0		97.0		
Max Q Clear Time (g_c+l1), s	107.9			35.2		42.7		
Green Ext Time (p_c), s	0.0			7.0		50.5		
Intersection Summary								
HCM 2010 Ctrl Delay			33.7					
HCM 2010 LOS			C					

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↓		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↓	
Volume (vph)	4	587	29	447	446	468	98	1350	1042	252	638	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	200		0	0		260	150		0	400		120
Storage Lanes	1		1	2		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			35			25			40	
Link Distance (ft)		465			621			484			872	
Travel Time (s)		10.6			12.1			13.2			14.9	
Confl. Peds. (#/hr)			8			4			4			
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Shared Lane Traffic (%)												
Enter Blocked Intersection	No											
Lane Alignment	Left	Left	Right									
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8			2			
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	20.0	34.0		25.0	30.0	18.0	12.0	40.0	25.0	18.0	40.0	
Total Split (s)	18.0	33.0		25.0	40.0	22.0	40.0	80.0	25.0	22.0	62.0	
Total Split (%)	11.3%	20.6%		15.6%	25.0%	13.8%	25.0%	50.0%	15.6%	13.8%	38.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	8.5	5.0	5.0	5.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	
Lead-Lag Optimize?					Yes	Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

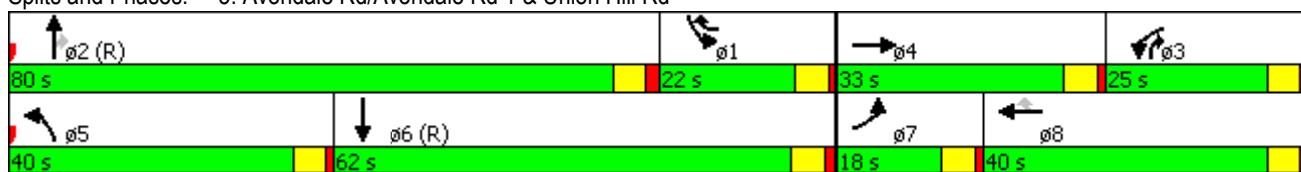
Actuated Cycle Length: 160

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

5/10/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		
Volume (veh/h)	4	587	29	447	446	468	98	1350	1042	252	638	18	
Number	7	4	14	3	8	18	5	2	12	1	6	16	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00			0.99	1.00		1.00		1.00	1.00		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1569	1863	1827	1827	1900	
Adj Flow Rate, veh/h	4	593	29	452	451	371	99	1364	1018	255	644	18	
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	4	4	4	
Cap, veh/h	11	601	29	430	547	795	123	1332	933	364	3036	85	
Arrive On Green	0.01	0.17	0.17	0.13	0.29	0.29	0.07	0.45	0.47	0.07	0.20	0.20	
Sat Flow, veh/h	1774	3432	168	3442	1863	1577	1774	2980	1579	1740	4988	139	
Grp Volume(v), veh/h	4	305	317	452	451	371	99	1364	1018	255	429	233	
Grp Sat Flow(s), veh/h/ln	1774	1770	1830	1721	1863	1577	1774	1490	1579	1740	1663	1802	
Q Serve(g_s), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	71.5	74.5	22.9	17.2	17.3	
Cycle Q Clear(g_c), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	71.5	74.5	22.9	17.2	17.3	
Prop In Lane	1.00			0.09	1.00		1.00	1.00		1.00	1.00	0.08	
Lane Grp Cap(c), veh/h	11	310	320	430	547	795	123	1332	933	364	2023	1097	
V/C Ratio(X)	0.37	0.99	0.99	1.05	0.82	0.47	0.80	1.02	1.09	0.70	0.21	0.21	
Avail Cap(c_a), veh/h	144	310	320	430	547	795	388	1332	933	364	2023	1097	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	
Upstream Filter(l)	1.00	1.00	1.00	0.81	0.81	0.81	1.00	1.00	1.00	0.91	0.91	0.91	
Uniform Delay(d), s/veh	79.2	65.8	65.8	70.0	52.6	26.3	73.4	44.2	32.7	69.6	31.9	31.9	
Incr Delay(d2), s/veh	19.6	47.2	47.0	53.0	8.2	0.3	4.5	31.0	57.4	5.6	0.2	0.4	
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%), veh/ln	0.2	17.5	18.2	12.7	19.8	10.7	4.5	35.1	47.2	11.6	8.0	8.8	
LnGrp Delay(d), s/veh	98.8	113.0	112.8	123.0	60.8	26.6	77.9	75.2	90.1	75.1	32.1	32.3	
LnGrp LOS	F	F	F	F	E	C	E	F	F	E	C	C	
Approach Vol, veh/h		626			1274			2481			917		
Approach Delay, s/veh		112.8			72.9			81.4			44.1		
Approach LOS		F			E			F			D		
Timer	1	2	3	4	5	6	7	8					
Assigned Phs	1	2	3	4	5	6	7	8					
Phs Duration (G+Y+Rc), s	39.5	80.0	25.0	33.0	16.1	103.4	6.0	52.0					
Change Period (Y+Rc), s	5.5	* 5.5	5.0	5.0	5.0	5.5	5.0	5.0					
Max Green Setting (Gmax), s	17.0	* 75	20.0	28.0	35.0	56.5	13.0	35.0					
Max Q Clear Time (g_c+l1), s	24.9	76.5	22.0	29.6	10.8	20.2	2.4	38.1					
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.5	8.8	0.0	0.0					
Intersection Summary													
HCM 2010 Ctrl Delay		76.6											
HCM 2010 LOS			E										
Notes													
User approved pedestrian interval to be less than phase max green.													
User approved ignoring U-Turning movement.													
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.													

2019 With Project (195 Apartments)

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑↑		↑	↑↑	
Volume (vph)	19	5	33	746	1	265	4	401	0	186	1244	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		219			262			340			1991	
Travel Time (s)		6.0			7.1			6.6			54.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	8%	8%	8%	3%	3%	3%
Shared Lane Traffic (%)				50%								
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	12.0	63.0		27.0	78.0
Total Split (%)	17.9%	17.9%	17.9%	17.9%	17.9%	17.9%	8.6%	45.0%		19.3%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

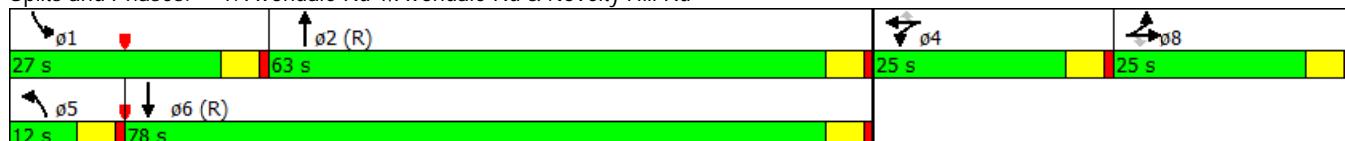
Actuated Cycle Length: 140

Offset: 24 (17%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖
Volume (veh/h)	19	5	33	746	1	265	4	401	0	186	1244	10
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1792	1863	1863	1863	1759	1759	0	1845	1553	1900
Adj Flow Rate, veh/h	20	5	31	795	0	71	4	427	0	198	1323	11
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	6	6	6	2	2	2	8	8	0	3	3	3
Cap, veh/h	43	11	48	507	0	226	7	1854	0	226	1972	16
Arrive On Green	0.03	0.03	0.03	0.14	0.00	0.14	0.00	0.18	0.00	0.13	0.66	0.68
Sat Flow, veh/h	1379	345	1524	3548	0	1583	1675	3431	0	1757	3000	25
Grp Volume(v), veh/h	25	0	31	795	0	71	4	427	0	198	651	683
Grp Sat Flow(s), veh/h/ln	1724	0	1524	1774	0	1583	1675	1671	0	1757	1476	1549
Q Serve(g_s), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	15.3	0.0	15.5	37.8	37.8
Cycle Q Clear(g_c), s	2.0	0.0	2.8	20.0	0.0	5.6	0.3	15.3	0.0	15.5	37.8	37.8
Prop In Lane	0.80			1.00	1.00		1.00	1.00		0.00	1.00	0.02
Lane Grp Cap(c), veh/h	54	0	48	507	0	226	7	1854	0	226	970	1018
V/C Ratio(X)	0.46	0.00	0.65	1.57	0.00	0.31	0.58	0.23	0.00	0.88	0.67	0.67
Avail Cap(c_a), veh/h	246	0	218	507	0	226	84	1854	0	276	970	1018
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.79	0.79	0.79
Uniform Delay (d), s/veh	66.7	0.0	67.1	60.0	0.0	53.8	69.8	31.7	0.0	59.9	14.7	14.7
Incr Delay (d2), s/veh	6.1	0.0	14.0	265.3	0.0	0.8	59.3	0.3	0.0	18.7	2.9	2.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.0	0.0	1.4	28.5	0.0	2.5	0.3	7.1	0.0	8.7	16.2	16.9
LnGrp Delay(d), s/veh	72.7	0.0	81.0	325.3	0.0	54.6	129.1	32.0	0.0	78.7	17.6	17.5
LnGrp LOS	E		F	F		D	F	C		E	B	B
Approach Vol, veh/h		56			866			431		1532		
Approach Delay, s/veh		77.3			303.1			32.9		25.4		
Approach LOS		E			F			C		C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	82.6		25.0	5.6	100.0		9.4				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	22.0	58.0		20.0	7.0	73.0		20.0				
Max Q Clear Time (g_c+l1), s	17.5	17.3		22.0	2.3	40.8		4.8				
Green Ext Time (p_c), s	0.5	26.9		0.0	0.0	22.8		0.1				

Intersection Summary

HCM 2010 Ctrl Delay 110.9

HCM 2010 LOS F

Notes

User approved volume balancing among the lanes for turning movement.

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	7	4	4	7	4	4	11	11	7	11	11
Volume (vph)	29	6	57	56	4	30	4	665	8	9	2002	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		384			667			1512			582	
Travel Time (s)		10.5			18.2			29.5			15.9	
Confl. Peds. (#/hr)												2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	8%	8%	8%	2%	2%	2%
Shared Lane Traffic (%)												
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phase	8	8	8	4	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	26.0	26.0	26.0	25.0	25.0	25.0	11.0	78.0		11.0	78.0	
Total Split (%)	18.6%	18.6%	18.6%	17.9%	17.9%	17.9%	7.9%	55.7%		7.9%	55.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	3.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	8.0
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 133 (95%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



HCM 2010 Signalized Intersection Summary

2: Avondale Rd 1 & NE 95 St

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↘ ↙
Volume (veh/h)	29	6	57	56	4	30	4	665	8	9	2002	7
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1845	1900	1845	1845	1759	1759	1900	1863	1569	1900
Adj Flow Rate, veh/h	32	7	63	62	4	33	4	739	9	10	2224	8
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	8	8	8	2	2	2
Cap, veh/h	79	17	85	85	6	81	7	2509	31	16	2210	8
Arrive On Green	0.05	0.05	0.05	0.05	0.05	0.05	0.01	1.00	1.00	0.01	0.73	0.75
Sat Flow, veh/h	1454	318	1568	1655	107	1568	1675	3382	41	1774	3046	11
Grp Volume(v), veh/h	39	0	63	66	0	33	4	365	383	10	1087	1145
Grp Sat Flow(s), veh/h/ln	1772	0	1568	1762	0	1568	1675	1671	1752	1774	1490	1567
Q Serve(g_s), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Cycle Q Clear(g_c), s	3.0	0.0	5.5	5.2	0.0	2.9	0.3	0.0	0.0	0.8	101.6	101.6
Prop In Lane	0.82		1.00	0.94		1.00	1.00		0.02	1.00		0.01
Lane Grp Cap(c), veh/h	96	0	85	91	0	81	7	1240	1300	16	1081	1137
V/C Ratio(X)	0.40	0.00	0.74	0.73	0.00	0.41	0.58	0.29	0.29	0.61	1.01	1.01
Avail Cap(c_a), veh/h	266	0	235	252	0	224	72	1240	1300	76	1081	1137
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.0	0.0	65.2	65.4	0.0	64.3	69.3	0.0	0.0	69.1	19.2	19.2
Incr Delay (d2), s/veh	2.7	0.0	11.7	10.4	0.0	3.3	58.0	0.6	0.6	31.8	28.8	28.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.5	0.0	2.7	2.8	0.0	1.3	0.3	0.2	0.2	0.5	49.8	52.2
LnGrp Delay(d), s/veh	66.7	0.0	76.9	75.8	0.0	67.6	127.3	0.6	0.6	100.9	48.0	47.6
LnGrp LOS	E		E	E		E	F	A	A	F	F	F
Approach Vol, veh/h	102				99			752			2242	
Approach Delay, s/veh	73.0				73.1			1.2			48.0	
Approach LOS	E				E			A			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	108.9		12.2	5.6	109.6		12.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	6.0	73.0		20.0	6.0	73.0		21.0				
Max Q Clear Time (g_c+l1), s	2.8	2.0		7.2	2.3	104.6		7.5				
Green Ext Time (p_c), s	0.0	39.6		0.2	0.0	0.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay				38.6								
HCM 2010 LOS				D								

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↑	↑↔		↑	↑↔	
Volume (vph)	8	0	50	83	0	21	10	669	22	6	2166	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		686			583			2421			1512	
Travel Time (s)		18.7			15.9			47.2			41.2	
Confl. Peds. (#/hr)	5				5			5			7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		5.0	4.0	
Minimum Split (s)	25.0	25.0		26.0	26.0		10.0	25.0		10.0	28.0	
Total Split (s)	26.0	26.0		26.0	26.0		10.0	104.0		10.0	104.0	
Total Split (%)	18.6%	18.6%		18.6%	18.6%		7.1%	74.3%		7.1%	74.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	3.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0		5.0	8.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 17 (12%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



HCM 2010 Signalized Intersection Summary

3: Avondale Rd 1 & 180th Ave NE

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↖		↑	↑↑		↑	↑↑	
Volume (veh/h)	8	0	50	83	0	21	10	669	22	6	2166	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1810	1810	1900	1863	1569	1900
Adj Flow Rate, veh/h	9	0	54	90	0	23	11	727	24	7	2354	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	2	2	2
Cap, veh/h	42	12	147	161	2	30	17	2649	87	15	2310	5
Arrive On Green	0.10	0.00	0.10	0.10	0.00	0.10	0.02	1.00	1.00	0.02	1.00	1.00
Sat Flow, veh/h	119	115	1406	1100	20	286	1723	3396	112	1774	3051	6
Grp Volume(v), veh/h	63	0	0	113	0	0	11	368	383	7	1149	1210
Grp Sat Flow(s), veh/h/ln	1640	0	0	1406	0	0	1723	1719	1789	1774	1490	1567
Q Serve(g_s), s	0.0	0.0	0.0	5.7	0.0	0.0	0.9	0.0	0.0	0.5	0.0	102.2
Cycle Q Clear(g_c), s	5.1	0.0	0.0	10.9	0.0	0.0	0.9	0.0	0.0	0.5	0.0	102.2
Prop In Lane	0.14		0.86	0.80		0.20	1.00		0.06	1.00		0.00
Lane Grp Cap(c), veh/h	200	0	0	193	0	0	17	1341	1396	15	1128	1187
V/C Ratio(X)	0.31	0.00	0.00	0.59	0.00	0.00	0.64	0.27	0.27	0.46	1.02	1.02
Avail Cap(c_a), veh/h	270	0	0	255	0	0	62	1341	1396	63	1128	1187
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.98	0.98	0.98	0.17	0.17	0.17
Uniform Delay (d), s/veh	58.5	0.0	0.0	60.9	0.0	0.0	68.4	0.0	0.0	68.5	0.0	0.0
Incr Delay (d2), s/veh	0.9	0.0	0.0	2.8	0.0	0.0	33.0	0.5	0.5	3.6	15.9	15.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	2.3	0.0	0.0	4.4	0.0	0.0	0.6	0.2	0.2	0.3	5.0	5.2
LnGrp Delay(d), s/veh	59.3	0.0	0.0	63.7	0.0	0.0	101.4	0.5	0.5	72.1	15.9	15.9
LnGrp LOS	E		E			F	A	A	E	F	F	
Approach Vol, veh/h		63			113			762			2366	
Approach Delay, s/veh		59.3			63.7			1.9			16.1	
Approach LOS		E			E			A			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.2	114.2		19.6	6.4	114.0		19.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	99.0		21.0	5.0	99.0		21.0				
Max Q Clear Time (g_c+l1), s	2.5	2.0		7.1	2.9	104.2		12.9				
Green Ext Time (p_c), s	0.0	96.4		0.8	0.0	0.0		0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			15.3									
HCM 2010 LOS			B									

Lanes, Volumes, Timings

4: Avondale Rd 1 & Avondale Way

3/14/2017

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	98	1	0	609	2043	414
Ideal Flow (vphpl)	1900	1900	1900	1900	1600	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			35	25	
Link Distance (ft)	1136			883	2421	
Travel Time (s)	25.8			17.2	66.0	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	8%	8%	2%	2%
Shared Lane Traffic (%)						
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	15.0	15.0		125.0	125.0	
Total Split (%)	10.7%	10.7%		89.3%	89.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	3.0	
Total Lost Time (s)	5.0	5.0		5.0	8.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 77 (55%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary

4: Avondale Rd 1 & Avondale Way

3/14/2017

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑↑	↑		↑↑	↑↑	↑
Volume (veh/h)	98	1	0	609	2043	414
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	0	1759	1569	1863
Adj Flow Rate, veh/h	101	1	0	628	2106	0
Adj No. of Lanes	2	1	0	2	2	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	0	8	2	2
Cap, veh/h	151	69	0	2958	2573	1401
Arrive On Green	0.04	0.04	0.00	1.00	1.00	0.00
Sat Flow, veh/h	3442	1583	0	3519	3059	1583
Grp Volume(v), veh/h	101	1	0	628	2106	0
Grp Sat Flow(s), veh/h/ln	1721	1583	0	1671	1490	1583
Q Serve(g_s), s	4.0	0.1	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.0	0.1	0.0	0.0	0.0	0.0
Prop In Lane	1.00	1.00	0.00			1.00
Lane Grp Cap(c), veh/h	151	69	0	2958	2573	1401
V/C Ratio(X)	0.67	0.01	0.00	0.21	0.82	0.00
Avail Cap(c_a), veh/h	246	113	0	2958	2573	1401
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00
Upstream Filter(l)	0.99	0.99	0.00	0.92	0.09	0.00
Uniform Delay (d), s/veh	65.9	64.1	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	5.0	0.1	0.0	0.2	0.3	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	2.0	0.0	0.0	0.1	0.1	0.0
LnGrp Delay(d), s/veh	71.0	64.1	0.0	0.2	0.3	0.0
LnGrp LOS	E	E		A	A	
Approach Vol, veh/h	102			628	2106	
Approach Delay, s/veh	70.9			0.2	0.3	
Approach LOS	E			A	A	
Timer	1	2	3	4	5	6
Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s	128.9			11.1		128.9
Change Period (Y+Rc), s	5.0			5.0		5.0
Max Green Setting (Gmax), s	120.0			10.0		120.0
Max Q Clear Time (g_c+l1), s	2.0			6.0		3.0
Green Ext Time (p_c), s	96.6			0.2		95.9
Intersection Summary						
HCM 2010 Ctrl Delay			2.8			
HCM 2010 LOS			A			

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↑	
Volume (vph)	6	354	84	750	280	148	75	405	568	222	1613	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1600	1900
Storage Length (ft)	200			0	0	260	150		0	400		120
Storage Lanes	1			0	2		1	1		1	1	1
Taper Length (ft)	25				25			25			25	
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		30			35			35			25	
Link Distance (ft)		455			647			504			883	
Travel Time (s)		10.3			12.6			9.8			24.1	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8				2		
Detector Phase	7	4		3	8	1	5	2	3	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0	
Minimum Split (s)	25.0	34.0		25.0	30.0	13.0	11.0	32.5	25.0	13.0	30.5	
Total Split (s)	25.0	34.0		39.0	48.0	31.0	11.0	36.0	39.0	31.0	56.0	
Total Split (%)	17.9%	24.3%		27.9%	34.3%	22.1%	7.9%	25.7%	27.9%	22.1%	40.0%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.5	5.0	5.0	8.5	
Lead/Lag	Lead	Lead		Lag	Lag	Lead	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 140

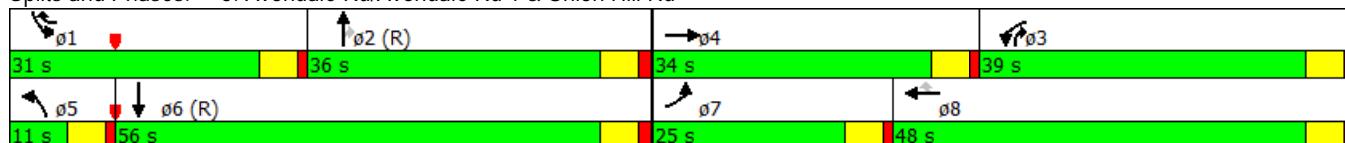
Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 135

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑↑		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↑	
Volume (veh/h)	6	354	84	750	280	148	75	405	568	222	1613	8
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1776	1776	1776	1810	1810	1810	1863	1569	1900
Adj Flow Rate, veh/h	6	369	88	781	292	94	78	422	516	231	1680	8
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	7	7	7	5	5	5	2	2	2
Cap, veh/h	16	449	106	797	696	817	74	1043	840	265	1709	8
Arrive On Green	0.01	0.16	0.16	0.41	0.65	0.65	0.04	0.30	0.30	0.05	0.13	0.14
Sat Flow, veh/h	1774	2843	671	3281	1776	1509	1723	3438	1538	1774	4399	21
Grp Volume(v), veh/h	6	228	229	781	292	94	78	422	516	231	1090	598
Grp Sat Flow(s),veh/h/ln	1774	1770	1744	1640	1776	1509	1723	1719	1538	1774	1427	1565
Q Serve(g_s), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.6	13.1	18.1	53.3	53.3
Cycle Q Clear(g_c), s	0.5	17.4	17.8	32.9	11.0	2.5	6.0	13.6	13.1	18.1	53.3	53.3
Prop In Lane	1.00		0.38	1.00		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	16	279	276	797	696	817	74	1043	840	265	1109	608
V/C Ratio(X)	0.38	0.82	0.83	0.98	0.42	0.12	1.06	0.40	0.61	0.87	0.98	0.98
Avail Cap(c_a), veh/h	253	367	361	797	696	817	74	1043	840	329	1109	608
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(l)	1.00	1.00	1.00	0.82	0.82	0.82	1.00	1.00	1.00	0.43	0.43	0.43
Uniform Delay (d), s/veh	69.0	57.0	57.1	41.3	16.6	8.7	67.0	38.7	7.6	65.2	60.6	60.6
Incr Delay (d2), s/veh	14.3	10.4	11.8	24.0	0.3	0.1	121.0	1.2	3.3	9.2	14.2	20.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	9.4	9.5	17.5	5.3	1.1	5.3	6.7	6.4	9.6	23.3	26.6
LnGrp Delay(d),s/veh	83.3	67.3	69.0	65.2	16.9	8.8	189.3	39.9	10.9	74.4	74.8	80.9
LnGrp LOS	F	E	E	E	B	A	F	D	B	E	E	F
Approach Vol, veh/h		463			1167			1016			1919	
Approach Delay, s/veh		68.3			48.6			36.6			76.6	
Approach LOS		E			D			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.9	48.0	39.0	27.1	11.0	62.9	6.2	59.9				
Change Period (Y+Rc), s	5.0	5.5	5.0	5.0	5.0	5.5	5.0	5.0				
Max Green Setting (Gmax), s	26.0	30.5	34.0	29.0	6.0	50.5	20.0	43.0				
Max Q Clear Time (g_c+l1), s	20.1	15.6	34.9	19.8	8.0	56.3	2.5	13.0				
Green Ext Time (p_c), s	0.8	13.8	0.0	2.3	0.0	0.0	0.0	11.9				
Intersection Summary												
HCM 2010 Ctrl Delay				59.7								
HCM 2010 LOS				E								
Notes	User approved ignoring U-Turning movement.											

Lanes, Volumes, Timings

1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↗	↖	↔	↑	↗	↖	↑↑	↖	↑↑	↗
Volume (vph)	11	4	22	382	2	306	29	1558	0	231	890	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	150		0	150		0
Storage Lanes	0		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red				Yes			Yes			Yes		Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		174			206			383			2033	
Travel Time (s)		4.7			5.6			10.4			34.7	
Confl. Peds. (#/hr)			3									
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)			50%									
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	11.0	25.0		11.0	25.0	
Total Split (s)	25.0	25.0	25.0	35.0	35.0	35.0	18.0	76.0		24.0	82.0	
Total Split (%)	15.6%	15.6%	15.6%	21.9%	21.9%	21.9%	11.3%	47.5%		15.0%	51.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	C-Max		None	C-Max							

Intersection Summary

Area Type: Other

Cycle Length: 160

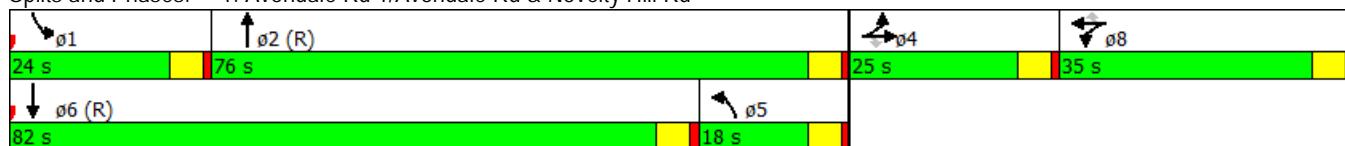
Actuated Cycle Length: 160

Offset: 154 (96%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd



HCM 2010 Signalized Intersection Summary
1: Avondale Rd 1/Avondale Rd & Novelty Hill Rd

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖											
Volume (veh/h)	11	4	22	382	2	306	29	1558	0	231	890	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1881	1584	0	1863	1863	1900
Adj Flow Rate, veh/h	11	4	0	391	0	71	30	1590	0	236	908	19
Adj No. of Lanes	0	1	1	2	0	1	1	2	0	1	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	1	1	1	1	1	0	2	2	2
Cap, veh/h	25	9	30	487	0	217	428	1754	0	211	1706	36
Arrive On Green	0.02	0.02	0.00	0.14	0.00	0.14	0.16	0.39	0.00	0.12	0.48	0.48
Sat Flow, veh/h	1344	489	1615	3583	0	1599	1792	3089	0	1774	3545	74
Grp Volume(v), veh/h	15	0	0	391	0	71	30	1590	0	236	453	474
Grp Sat Flow(s),veh/h/ln	1833	0	1615	1792	0	1599	1792	1505	0	1774	1770	1850
Q Serve(g_s), s	1.3	0.0	0.0	16.9	0.0	6.4	2.3	79.7	0.0	19.0	28.6	28.6
Cycle Q Clear(g_c), s	1.3	0.0	0.0	16.9	0.0	6.4	2.3	79.7	0.0	19.0	28.6	28.6
Prop In Lane	0.73			1.00	1.00		1.00	1.00		0.00	1.00	0.04
Lane Grp Cap(c), veh/h	34	0	30	487	0	217	428	1754	0	211	852	890
V/C Ratio(X)	0.44	0.00	0.00	0.80	0.00	0.33	0.07	0.91	0.00	1.12	0.53	0.53
Avail Cap(c_a), veh/h	229	0	202	672	0	300	428	1754	0	211	852	890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.90	0.90	0.90
Uniform Delay (d), s/veh	77.7	0.0	0.0	67.0	0.0	62.5	52.1	44.6	0.0	70.5	28.9	28.9
Incr Delay (d2), s/veh	8.5	0.0	0.0	4.9	0.0	0.9	0.1	8.3	0.0	94.9	2.1	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	8.7	0.0	2.9	1.1	35.3	0.0	14.9	14.5	15.1
LnGrp Delay(d),s/veh	86.1	0.0	0.0	71.9	0.0	63.4	52.2	53.0	0.0	165.4	31.1	31.0
LnGrp LOS	F			E		E	D	D		F	C	C
Approach Vol, veh/h		15			462			1620			1163	
Approach Delay, s/veh		86.1			70.6			52.9			58.3	
Approach LOS		F			E			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.0	101.2		8.0	43.2	82.0		26.8				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	71.0		20.0	13.0	77.0		30.0				
Max Q Clear Time (g_c+l1), s	21.0	82.7		3.3	4.3	30.6		18.9				
Green Ext Time (p_c), s	0.0	0.0		0.0	7.6	10.3		2.8				
Intersection Summary												
HCM 2010 Ctrl Delay			57.5									
HCM 2010 LOS			E									

Notes

User approved volume balancing among the lanes for turning movement.

Lanes, Volumes, Timings
2: Avondale Rd 1 & NE 95 St

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑↑	↑	↑	↑↑	↑
Volume (vph)	16	0	27	28	8	60	33	2097	83	66	1118	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		25	0		25	160		0	125		0
Storage Lanes	0		1	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		388			644			1512			538	
Travel Time (s)		10.6			17.6			41.2			9.2	
Confl. Peds. (#/hr)			2						2			3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	3%	3%	3%
Shared Lane Traffic (%)												
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						
Detector Phase	4	4	4	8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	11.0	25.0		11.0	25.0	
Total Split (s)	19.0	19.0	19.0	23.0	23.0	23.0	15.0	102.0		16.0	103.0	
Total Split (%)	11.9%	11.9%	11.9%	14.4%	14.4%	14.4%	9.4%	63.8%		10.0%	64.4%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0	5.0	5.0	8.0		5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 111 (69%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 2: Avondale Rd 1 & NE 95 St



HCM 2010 Signalized Intersection Summary

2: Avondale Rd 1 & NE 95 St

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙	↖ ↗ ↘ ↙ ↖ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↙
Volume (veh/h)	16	0	27	28	8	60	33	2097	83	66	1118	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1881	1584	1900	1845	1845	1900
Adj Flow Rate, veh/h	16	0	27	28	8	61	33	2118	84	67	1129	18
Adj No. of Lanes	0	1	1	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	3	3	3
Cap, veh/h	51	0	44	71	20	81	330	2155	85	84	2163	34
Arrive On Green	0.03	0.00	0.03	0.05	0.05	0.05	0.37	1.00	1.00	0.05	0.61	0.61
Sat Flow, veh/h	1810	0	1580	1422	406	1615	1792	2952	116	1757	3531	56
Grp Volume(v), veh/h	16	0	27	36	0	61	33	1073	1129	67	560	587
Grp Sat Flow(s), veh/h/ln	1810	0	1580	1829	0	1615	1792	1505	1563	1757	1752	1835
Q Serve(g_s), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	29.1	29.1
Cycle Q Clear(g_c), s	1.4	0.0	2.7	3.1	0.0	6.0	1.9	0.0	0.0	6.0	29.1	29.1
Prop In Lane	1.00		1.00	0.78		1.00	1.00		0.07	1.00		0.03
Lane Grp Cap(c), veh/h	51	0	44	92	0	81	330	1099	1142	84	1073	1124
V/C Ratio(X)	0.32	0.00	0.61	0.39	0.00	0.75	0.10	0.98	0.99	0.80	0.52	0.52
Avail Cap(c_a), veh/h	158	0	138	206	0	182	330	1099	1142	121	1073	1124
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	0.16	0.16	0.16	1.00	1.00	1.00
Uniform Delay (d), s/veh	76.2	0.0	76.9	73.6	0.0	75.0	41.8	0.0	0.0	75.4	17.7	17.7
Incr Delay (d2), s/veh	3.5	0.0	12.7	2.7	0.0	13.1	0.0	6.7	8.5	20.6	1.8	1.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.7	0.0	1.3	1.6	0.0	3.0	1.0	2.1	2.7	3.4	14.5	15.2
LnGrp Delay(d), s/veh	79.7	0.0	89.6	76.3	0.0	88.1	41.8	6.7	8.5	96.0	19.5	19.4
LnGrp LOS	E		F	E		F	D	A	A	F	B	B
Approach Vol, veh/h		43			97			2235			1214	
Approach Delay, s/veh		85.9			83.7			8.2			23.7	
Approach LOS		F			F			A			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.7	124.8		9.5	34.5	103.0		13.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	97.0		14.0	10.0	98.0		18.0				
Max Q Clear Time (g_c+l1), s	8.0	3.0		4.7	3.9	31.1		8.0				
Green Ext Time (p_c), s	0.0	29.2		0.0	4.8	5.6		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			16.4									
HCM 2010 LOS			B									
Notes												
User approved pedestrian interval to be less than phase max green.												

Lanes, Volumes, Timings
3: Avondale Rd 1 & 180th Ave NE

3/14/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↑	↑↔		↑	↑↔	
Volume (vph)	10	0	25	47	0	12	39	2212	86	21	1221	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	200		0	100		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			40	
Link Distance (ft)		682			396			2418			1512	
Travel Time (s)		18.6			10.8			65.9			25.8	
Confl. Peds. (#/hr)	5					5			5			5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Shared Lane Traffic (%)												
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		5.0	5.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	27.0	27.0		26.0	26.0		10.0	25.0		10.0	25.0	
Total Split (s)	27.0	27.0		27.0	27.0		14.0	123.0		10.0	119.0	
Total Split (%)	16.9%	16.9%		16.9%	16.9%		8.8%	76.9%		6.3%	74.4%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	3.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		5.0	8.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 86 (54%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 3: Avondale Rd 1 & 180th Ave NE



HCM 2010 Signalized Intersection Summary

3: Avondale Rd 1 & 180th Ave NE

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↖		↑	↑↑		↑	↑↑	
Volume (veh/h)	10	0	25	47	0	12	39	2212	86	21	1221	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1881	1584	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	0	26	49	0	13	41	2328	91	23	1285	5
Adj No. of Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	49	12	75	115	5	21	53	2377	92	29	2930	11
Arrive On Green	0.07	0.00	0.07	0.07	0.00	0.07	0.06	1.00	1.00	0.03	1.00	1.00
Sat Flow, veh/h	295	182	1128	1126	70	317	1792	2954	115	1774	3616	14
Grp Volume(v), veh/h	37	0	0	62	0	0	41	1178	1241	23	629	661
Grp Sat Flow(s), veh/h/ln	1606	0	0	1514	0	0	1792	1505	1564	1774	1770	1860
Q Serve(g_s), s	0.0	0.0	0.0	2.5	0.0	0.0	3.6	0.0	0.0	2.1	0.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	0.0	6.0	0.0	0.0	3.6	0.0	0.0	2.1	0.0	0.0
Prop In Lane	0.30		0.70	0.79		0.21	1.00		0.07	1.00		0.01
Lane Grp Cap(c), veh/h	136	0	0	141	0	0	53	1211	1258	29	1434	1507
V/C Ratio(X)	0.27	0.00	0.00	0.44	0.00	0.00	0.77	0.97	0.99	0.80	0.44	0.44
Avail Cap(c_a), veh/h	242	0	0	240	0	0	101	1211	1258	55	1434	1507
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	0.20	0.20	0.20	0.91	0.91	0.91
Uniform Delay (d), s/veh	71.3	0.0	0.0	72.3	0.0	0.0	74.8	0.0	0.0	77.1	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	0.0	2.1	0.0	0.0	4.7	6.7	8.4	34.9	0.9	0.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	1.6	0.0	0.0	2.8	0.0	0.0	1.8	2.3	2.9	1.3	0.4	0.4
LnGrp Delay(d), s/veh	72.4	0.0	0.0	74.5	0.0	0.0	79.5	6.7	8.4	112.1	0.9	0.8
LnGrp LOS	E		E			E	A	A	F	A	A	
Approach Vol, veh/h	37			62			2460			1313		
Approach Delay, s/veh	72.4			74.5			8.8			2.8		
Approach LOS	E			E			A			A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	136.8		15.6	9.7	134.6		15.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	118.0		22.0	9.0	114.0		22.0				
Max Q Clear Time (g_c+l1), s	4.1	3.0		5.5	5.6	2.0		8.0				
Green Ext Time (p_c), s	0.0	114.3		0.4	0.0	111.3		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			8.4									
HCM 2010 LOS			A									

Lanes, Volumes, Timings

4: Avondale Rd 1 & Avondale Way

3/14/2017

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	706	47	0	1831	965	428
Ideal Flow (vphpl)	1900	1900	1900	1600	1900	1900
Storage Length (ft)	500	20	0			100
Storage Lanes	1	1	0			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	30			25	40	
Link Distance (ft)	533			872	2418	
Travel Time (s)	12.1			23.8	41.2	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	1%	1%	1%	2%	2%
Shared Lane Traffic (%)						
Turn Type	Prot	Prot		NA	NA	Free
Protected Phases	4	4		2	6	
Permitted Phases				2		Free
Detector Phase	4	4		2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0		7.0	7.0	
Minimum Split (s)	10.0	10.0		12.0	12.0	
Total Split (s)	58.0	58.0		102.0	102.0	
Total Split (%)	36.3%	36.3%		63.8%	63.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		3.0	0.0	
Total Lost Time (s)	5.0	5.0		8.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None		C-Max	C-Max	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Splits and Phases: 4: Avondale Rd 1 & Avondale Way



HCM 2010 Signalized Intersection Summary

4: Avondale Rd 1 & Avondale Way

3/14/2017

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↑↑	↑		↑↑	↑↑	↑
Volume (veh/h)	706	47	0	1831	965	428
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	0	1584	1863	1863
Adj Flow Rate, veh/h	759	51	0	1969	1038	0
Adj No. of Lanes	2	1	0	2	2	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	1	2	2
Cap, veh/h	911	419	0	1976	2390	1069
Arrive On Green	0.26	0.26	0.00	0.87	0.22	0.00
Sat Flow, veh/h	3476	1599	0	3168	3632	1583
Grp Volume(v), veh/h	759	51	0	1969	1038	0
Grp Sat Flow(s), veh/h/ln	1738	1599	0	1505	1770	1583
Q Serve(g_s), s	33.0	3.9	0.0	102.0	40.4	0.0
Cycle Q Clear(g_c), s	33.0	3.9	0.0	102.0	40.4	0.0
Prop In Lane	1.00	1.00	0.00			1.00
Lane Grp Cap(c), veh/h	911	419	0	1976	2390	1069
V/C Ratio(X)	0.83	0.12	0.00	1.00	0.43	0.00
Avail Cap(c_a), veh/h	1151	530	0	1976	2390	1069
HCM Platoon Ratio	1.00	1.00	1.00	1.33	0.33	0.33
Upstream Filter(l)	1.00	1.00	0.00	0.29	0.90	0.00
Uniform Delay (d), s/veh	55.7	45.0	0.0	9.9	35.9	0.0
Incr Delay (d2), s/veh	4.3	0.1	0.0	10.0	0.5	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	16.4	1.7	0.0	42.8	20.0	0.0
LnGrp Delay(d), s/veh	60.1	45.1	0.0	19.9	36.4	0.0
LnGrp LOS	E	D		B	D	
Approach Vol, veh/h	810			1969	1038	
Approach Delay, s/veh	59.1			19.9	36.4	
Approach LOS	E			B	D	
Timer	1	2	3	4	5	6
Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s	113.1			46.9		113.1
Change Period (Y+Rc), s	5.0			5.0		5.0
Max Green Setting (Gmax), s	97.0			53.0		97.0
Max Q Clear Time (g_c+l1), s	105.0			35.0		42.4
Green Ext Time (p_c), s	0.0			6.9		50.6
Intersection Summary						
HCM 2010 Ctrl Delay			32.7			
HCM 2010 LOS			C			

Lanes, Volumes, Timings

5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

3/14/2017

	↑	→	↓	↗	↖	↙	↖	↗	↑	↗	↖	↓	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↑	↑↑		↑↑	↑	↑	↑	↑↑	↑	↑	↑↑↑		
Volume (vph)	4	587	29	447	446	466	98	1341	1042	251	633	18	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1600	1900	1900	1900	1900	
Storage Length (ft)	200		0	0		260	150		0	400		120	
Storage Lanes	1		1	2		1	1		1	1		1	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			35			25			40		
Link Distance (ft)		465			621			484			872		
Travel Time (s)		10.6			12.1			13.2			14.9		
Confl. Peds. (#/hr)			8			4			4				
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%	
Shared Lane Traffic (%)													
Turn Type	Prot	NA		Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		
Protected Phases	7	4		3	8	1	5	2	3	1	6		
Permitted Phases					8				2				
Detector Phase	7	4		3	8	1	5	2	3	1	6		
Switch Phase													
Minimum Initial (s)	6.0	6.0		6.0	6.0	8.0	5.0	8.0	6.0	8.0	8.0		
Minimum Split (s)	20.0	34.0		25.0	30.0	18.0	12.0	40.0	25.0	18.0	40.0		
Total Split (s)	18.0	33.0		25.0	40.0	22.0	40.0	80.0	25.0	22.0	62.0		
Total Split (%)	11.3%	20.6%		15.6%	25.0%	13.8%	25.0%	50.0%	15.6%	13.8%	38.8%		
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.5		
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	8.5	5.0	5.0	5.5		
Lead/Lag	Lead	Lead		Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag		
Lead-Lag Optimize?					Yes	Yes	Yes			Yes	Yes		
Recall Mode	None	None		None	None	None	None	C-Max	None	None	C-Max		

Intersection Summary

Area Type: Other

Cycle Length: 160

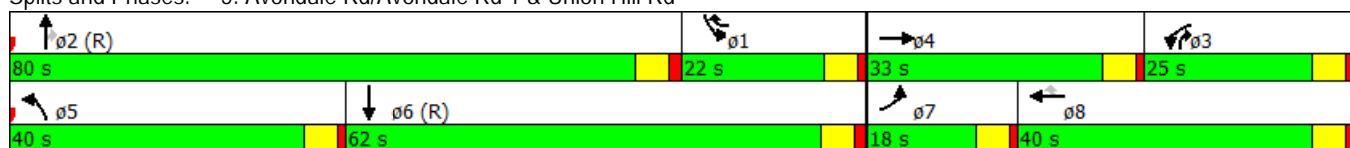
Actuated Cycle Length: 160

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green, Master Intersection

Natural Cycle: 140

Control Type: Actuated-Coordinated

Splits and Phases: 5: Avondale Rd/Avondale Rd 1 & Union Hill Rd



HCM 2010 Signalized Intersection Summary
5: Avondale Rd/Avondale Rd 1 & Union Hill Rd

3/14/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖			↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖ ↗ ↘ ↙ ↖		
Volume (veh/h)	4	587	29	447	446	466	98	1341	1042	251	633	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.99	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1569	1863	1827	1827	1900
Adj Flow Rate, veh/h	4	593	29	452	451	368	99	1355	1018	254	639	18
Adj No. of Lanes	1	2	0	2	1	1	1	2	1	1	3	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	4	4	4
Cap, veh/h	11	601	29	430	547	795	123	1332	933	364	3035	85
Arrive On Green	0.01	0.17	0.17	0.13	0.29	0.29	0.07	0.45	0.47	0.07	0.20	0.20
Sat Flow, veh/h	1774	3432	168	3442	1863	1577	1774	2980	1579	1740	4987	140
Grp Volume(v), veh/h	4	305	317	452	451	368	99	1355	1018	254	425	232
Grp Sat Flow(s), veh/h/ln	1774	1770	1830	1721	1863	1577	1774	1490	1579	1740	1663	1802
Q Serve(g_s), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	71.5	74.5	22.8	17.1	17.2
Cycle Q Clear(g_c), s	0.4	27.5	27.6	20.0	36.1	1.8	8.8	71.5	74.5	22.8	17.1	17.2
Prop In Lane	1.00			0.09	1.00		1.00	1.00		1.00	1.00	0.08
Lane Grp Cap(c), veh/h	11	310	320	430	547	795	123	1332	933	364	2023	1097
V/C Ratio(X)	0.37	0.99	0.99	1.05	0.82	0.46	0.80	1.02	1.09	0.70	0.21	0.21
Avail Cap(c_a), veh/h	144	310	320	430	547	795	388	1332	933	364	2023	1097
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(l)	1.00	1.00	1.00	0.81	0.81	0.81	1.00	1.00	1.00	0.91	0.91	0.91
Uniform Delay (d), s/veh	79.2	65.8	65.8	70.0	52.6	26.2	73.4	44.2	32.7	69.5	31.9	31.9
Incr Delay (d2), s/veh	19.6	47.2	47.0	53.0	8.2	0.3	4.5	29.1	57.4	5.5	0.2	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.2	17.5	18.2	12.7	19.8	10.6	4.5	34.8	47.2	11.6	7.9	8.7
LnGrp Delay(d), s/veh	98.8	113.0	112.8	123.0	60.8	26.5	77.9	73.3	90.1	75.0	32.1	32.3
LnGrp LOS	F	F	F	F	E	C	E	F	F	E	C	C
Approach Vol, veh/h		626			1271			2472			911	
Approach Delay, s/veh		112.8			73.0			80.4			44.1	
Approach LOS		F			E			F			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	39.5	80.0	25.0	33.0	16.1	103.4	6.0	52.0				
Change Period (Y+Rc), s	5.5	* 5.5	5.0	5.0	5.0	5.5	5.0	5.0				
Max Green Setting (Gmax), s	17.0	* 75	20.0	28.0	35.0	56.5	13.0	35.0				
Max Q Clear Time (g_c+l1), s	24.8	76.5	22.0	29.6	10.8	20.1	2.4	38.1				
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.5	8.7	0.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			76.2									
HCM 2010 LOS			E									
Notes												
User approved pedestrian interval to be less than phase max green.												
User approved ignoring U-Turning movement.												

ATTACHMENT C

Travel Time Worksheets

Existing Travel Time Study on Avondale Road NE Corridor

A travel time study was conducted on the Avondale Road NE corridor during the peak morning commute period (7:00-9:00 a.m.) and the peak afternoon commute period (4:00-6:00 p.m.) on three weekdays (Tuesday, January 12 through Thursday, January 14, 2016). Travel times were collected for both directions of Avondale Road NE (northbound and southbound) between the intersections of NE Union Hill Road and NE Novelty Hill Rd. The total distance between NE Union Hill Road and NE Novelty Hill Road is approximately 5,750 feet or 1.09 miles. The existing travel time data collected at each intersection along the study corridor included two values. The first recorded value was the time when delay started and the vehicle reached a travel speed of 10 miles per hour (mph) and the second recorded value was the time the vehicle travelled through the intersection (consistent with the methodology the City of Redmond uses for Travel Time studies). Therefore, if the two recorded values at a particular intersection are the same, then there was no delay associated with the intersection.

The average travel time along the Avondale Road NE corridor was calculated by direction during the AM and PM peak periods for each of the three days observed. The average travel time was calculated by taking the total travel time for all the observations during the collection period (*i.e* 7-9 a.m. or 4-6 p.m.), removing the maximum and minimum observed travel times during the time period, and dividing the remaining travel time by the remaining number of observations (total observations minus 2). The three-day average peak period travel times were then calculated by averaging the travel times from each day (Tuesday through Thursday, January 12-14, 2016).

2019 With Project (347 Senior Housing Units) with Unsignalized
Access

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.2	23.6	0.17	25.5	B
180th Ave NE	III	35	55.0	2.0	57.0	0.46	29.0	B
NE 95 St	III	35	34.4	3.7	38.1	0.29	27.1	B
Novelty Hill Rd	III	35	22.4	25.0	47.4	0.17	13.3	E
Total	III		133.2	32.9	166.1	1.09	23.6	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.5	55.9	0.17	11.2	D
180th Ave NE	IV	25	43.8	15.9	59.7	0.29	17.3	C
Avondale Way	IV	25	70.2	5.1	75.3	0.46	21.9	B
Union Hill Rd	IV	25	30.1	105.1	135.2	0.17	4.5	F
Total	IV		175.5	150.6	326.1	1.09	12.0	D

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	29.1	58.8	0.17	10.1	D
180th Ave NE	IV	25	70.1	15.2	85.3	0.46	19.3	B
NE 95 St	IV	25	43.8	41.1	84.9	0.29	12.1	D
Novelty Hill Rd	IV	25	31.4	70.6	102.0	0.17	6.2	F
Total	IV		175.0	156.0	331.0	1.08	11.8	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	7.9	37.1	0.29	27.8	C
Avondale Way	II	40	43.5	8.2	51.7	0.46	31.9	B
Union Hill Rd	II	40	19.0	11.6	30.6	0.17	19.4	D
Total	II		111.8	33.2	145.0	1.08	26.9	C

2019 With Project (155 Senior Housing Units) with Unsignalized
Access

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.2	23.6	0.17	25.5	B
180th Ave NE	III	35	55.0	2.0	57.0	0.46	29.0	B
NE 95 St	III	35	34.4	3.8	38.2	0.29	27.0	B
Novelty Hill Rd	III	35	22.4	25.2	47.6	0.17	13.2	E
Total	III		133.2	33.2	166.4	1.09	23.5	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.5	55.9	0.17	11.2	D
180th Ave NE	IV	25	43.8	15.8	59.6	0.29	17.3	C
Avondale Way	IV	25	70.2	4.8	75.0	0.46	22.0	B
Union Hill Rd	IV	25	30.1	101.1	131.2	0.17	4.6	F
Total	IV		175.5	146.2	321.7	1.09	12.2	D

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	26.6	56.3	0.17	10.6	D
180th Ave NE	IV	25	70.1	15.1	85.2	0.46	19.4	B
NE 95 St	IV	25	43.8	40.5	84.3	0.29	12.2	D
Novelty Hill Rd	IV	25	31.4	69.8	101.2	0.17	6.2	F
Total	IV		175.0	152.0	327.0	1.08	11.9	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	7.9	37.1	0.29	27.8	C
Avondale Way	II	40	43.5	8.0	51.5	0.46	32.0	B
Union Hill Rd	II	40	19.0	11.6	30.6	0.17	19.4	D
Total	II		111.8	33.0	144.8	1.08	27.0	C

2019 With Project (248 Apartments) with Unsignalized Access

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.2	23.6	0.17	25.5	B
180th Ave NE	III	35	55.0	2.0	57.0	0.46	29.0	B
NE 95 St	III	35	34.4	3.8	38.2	0.29	27.0	B
Novelty Hill Rd	III	35	22.4	24.9	47.3	0.17	13.3	E
Total	III		133.2	32.9	166.1	1.09	23.6	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.7	56.1	0.17	11.2	D
180th Ave NE	IV	25	43.8	16.0	59.8	0.29	17.2	C
Avondale Way	IV	25	70.2	5.8	76.0	0.46	21.7	B
Union Hill Rd	IV	25	30.1	113.2	143.3	0.17	4.2	F
Total	IV		175.5	159.7	335.2	1.09	11.7	D

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	35.8	65.5	0.17	9.1	D
180th Ave NE	IV	25	70.1	15.0	85.1	0.46	19.4	B
NE 95 St	IV	25	43.8	41.5	85.3	0.29	12.1	D
Novelty Hill Rd	IV	25	31.4	71.7	103.1	0.17	6.1	F
Total	IV		175.0	164.0	339.0	1.08	11.5	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	8.0	37.2	0.29	27.7	C
Avondale Way	II	40	43.5	8.6	52.1	0.46	31.7	B
Union Hill Rd	II	40	19.0	11.4	30.4	0.17	19.6	D
Total	II		111.8	33.5	145.3	1.08	26.9	C

2019 With Project (195 Apartments) with Unsignalized Access

Arterial Level of Service

3/14/2017

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.0	23.4	0.17	25.7	B
180th Ave NE	III	35	55.0	1.9	56.9	0.46	29.0	B
NE 95 St	III	35	34.4	3.9	38.3	0.29	26.9	B
Novelty Hill Rd	III	35	22.4	24.4	46.8	0.17	13.4	E
Total	III		133.2	32.2	165.4	1.09	23.7	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.5	55.9	0.17	11.2	D
180th Ave NE	IV	25	43.8	16.0	59.8	0.29	17.2	C
Avondale Way	IV	25	70.2	5.7	75.9	0.46	21.8	B
Union Hill Rd	IV	25	30.1	109.8	139.9	0.17	4.3	F
Total	IV		175.5	156.0	331.5	1.09	11.8	D

Arterial Level of Service

3/14/2017

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	33.7	63.4	0.17	9.4	D
180th Ave NE	IV	25	70.1	15.0	85.1	0.46	19.4	B
NE 95 St	IV	25	43.8	41.2	85.0	0.29	12.1	D
Novelty Hill Rd	IV	25	31.4	71.2	102.6	0.17	6.1	F
Total	IV		175.0	161.1	336.1	1.08	11.6	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	8.0	37.2	0.29	27.7	C
Avondale Way	II	40	43.5	8.5	52.0	0.46	31.7	B
Union Hill Rd	II	40	19.0	11.4	30.4	0.17	19.6	D
Total	II		111.8	33.4	145.2	1.08	26.9	C

2019 With Project (347 Senior Housing Units) with Signalized
Access

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.4	23.8	0.17	25.3	B
180th Ave NE	III	35	55.0	4.0	59.0	0.46	28.0	B
NE 95 St	III	35	34.4	3.8	38.2	0.29	27.0	B
Novelty Hill Rd	III	35	22.4	25.6	48.0	0.17	13.1	E
Total	III		133.2	35.8	169.0	1.09	23.1	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.5	55.9	0.17	11.2	D
180th Ave NE	IV	25	43.8	15.6	59.4	0.29	17.4	C
Avondale Way	IV	25	70.2	6.2	76.4	0.46	21.6	B
Union Hill Rd	IV	25	30.1	104.2	134.3	0.17	4.5	F
Total	IV		175.5	150.5	326.0	1.09	12.0	D

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	29.1	58.8	0.17	10.1	D
180th Ave NE	IV	25	70.1	13.9	84.0	0.46	19.6	B
NE 95 St	IV	25	43.8	39.8	83.6	0.29	12.3	D
Novelty Hill Rd	IV	25	31.4	70.3	101.7	0.17	6.2	F
Total	IV		175.0	153.1	328.1	1.08	11.9	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	9.8	39.0	0.29	26.4	C
Avondale Way	II	40	43.5	12.5	56.0	0.46	29.4	B
Union Hill Rd	II	40	19.0	9.0	28.0	0.17	21.2	D
Total	II		111.8	36.8	148.6	1.08	26.3	C

2019 With Project (155 Senior Housing Units) with Signalized
Access

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.3	23.7	0.17	25.4	B
180th Ave NE	III	35	55.0	3.6	58.6	0.46	28.2	B
NE 95 St	III	35	34.4	3.9	38.3	0.29	26.9	B
Novelty Hill Rd	III	35	22.4	25.9	48.3	0.17	13.0	E
Total	III		133.2	35.7	168.9	1.09	23.2	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.4	55.8	0.17	11.3	D
180th Ave NE	IV	25	43.8	11.3	55.1	0.29	18.7	C
Avondale Way	IV	25	70.2	6.0	76.2	0.46	21.7	B
Union Hill Rd	IV	25	30.1	100.8	130.9	0.17	4.6	F
Total	IV		175.5	142.5	318.0	1.09	12.3	D

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	26.6	56.3	0.17	10.6	D
180th Ave NE	IV	25	70.1	12.4	82.5	0.46	20.0	B
NE 95 St	IV	25	43.8	39.6	83.4	0.29	12.4	D
Novelty Hill Rd	IV	25	31.4	69.5	100.9	0.17	6.2	F
Total	IV		175.0	148.1	323.1	1.08	12.1	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	9.4	38.6	0.29	26.7	C
Avondale Way	II	40	43.5	12.8	56.3	0.46	29.3	B
Union Hill Rd	II	40	19.0	8.7	27.7	0.17	21.5	D
Total	II		111.8	36.4	148.2	1.08	26.3	C

2019 With Project (248 Apartments) with Signalized Access

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.5	23.9	0.17	25.2	B
180th Ave NE	III	35	55.0	4.8	59.8	0.46	27.6	B
NE 95 St	III	35	34.4	3.8	38.2	0.29	27.0	B
Novelty Hill Rd	III	35	22.4	24.9	47.3	0.17	13.3	E
Total	III		133.2	36.0	169.2	1.09	23.1	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.7	56.1	0.17	11.2	D
180th Ave NE	IV	25	43.8	25.7	69.5	0.29	14.8	C
Avondale Way	IV	25	70.2	5.4	75.6	0.46	21.8	B
Union Hill Rd	IV	25	30.1	112.7	142.8	0.17	4.2	F
Total	IV		175.5	168.5	344.0	1.09	11.4	D

Arterial Level of Service

5/10/2016

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	35.8	65.5	0.17	9.1	D
180th Ave NE	IV	25	70.1	27.4	97.5	0.46	16.9	C
NE 95 St	IV	25	43.8	36.2	80.0	0.29	12.9	D
Novelty Hill Rd	IV	25	31.4	71.4	102.8	0.17	6.1	F
Total	IV		175.0	170.8	345.8	1.08	11.3	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	10.3	39.5	0.29	26.1	C
Avondale Way	II	40	43.5	13.0	56.5	0.46	29.2	B
Union Hill Rd	II	40	19.0	8.7	27.7	0.17	21.5	D
Total	II		111.8	37.5	149.3	1.08	26.1	C

2019 With Project (195 Apartments) with Signalized Access

Arterial Level of Service

3/14/2017

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	III	35	21.4	2.2	23.6	0.17	25.5	B
180th Ave NE	III	35	55.0	3.1	58.1	0.46	28.4	B
NE 95 St	III	35	34.4	3.9	38.3	0.29	26.9	B
Novelty Hill Rd	III	35	22.4	25.5	47.9	0.17	13.1	E
Total	III		133.2	34.7	167.9	1.09	23.3	C

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	IV	25	31.4	24.5	55.9	0.17	11.2	D
180th Ave NE	IV	25	43.8	21.4	65.2	0.29	15.8	C
Avondale Way	IV	25	70.2	5.2	75.4	0.46	21.9	B
Union Hill Rd	IV	25	30.1	109.1	139.2	0.17	4.3	F
Total	IV		175.5	160.2	335.7	1.09	11.7	D

Arterial Level of Service

3/14/2017

Arterial Level of Service: NB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Avondale Way	IV	25	29.7	33.7	63.4	0.17	9.4	D
180th Ave NE	IV	25	70.1	18.7	88.8	0.46	18.6	C
NE 95 St	IV	25	43.8	42.1	85.9	0.29	12.0	D
Novelty Hill Rd	IV	25	31.4	71.4	102.8	0.17	6.1	F
Total	IV		175.0	165.9	340.9	1.08	11.4	D

Arterial Level of Service: SB Avondale Rd 1

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
NE 95 St	II	40	20.1	5.5	25.6	0.17	24.5	C
180th Ave NE	II	40	29.2	6.7	35.9	0.29	28.7	B
Avondale Way	II	40	43.5	9.5	53.0	0.46	31.1	B
Union Hill Rd	II	40	19.0	9.5	28.5	0.17	20.9	D
Total	II		111.8	31.2	143.0	1.08	27.3	C